sefelec

Test & Measurement

Automatic wiring tester

SYNOR 4200

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w w w . s e f e l e c . c o m

WARRANTY :

SEFELEC warrants that units are free from defects in material and workmanship. SEFELEC warrants also that, when properly used, that units will perform in accordance with specifications of this manual.

If within one year after original delivery it is found not to meet this standard, it will be repaired at no charge in SEFELEC service facility in Lognes.

Changes in the unit not approved by SEFELEC will cancel this warranty.

SEFELEC will not be liable for any indirect damages resulting of the use of the unit.

This warranty is in lieu of all other warranties.

INTRODUCTION – SET UP

Warning : This unit must be used by qualified people. Every precautions for the use of units connected to the main must be taken during its use. In particular, this unit must be connected to earth.

The specifications of this manual, the correct operation of the unit as well as the operator's security are guaranteed only when the supplied are used. The measurement probes can include limitation or protective elements, therefore it is forbidden to modify without written agreement from SEFELEC company.

In case of use under other conditions than the one specified in this manual, the security of the user will be in danger.

These units can supply voltages and currents which could be lethal. Comply with the safety regulations related to the use of high voltage devices.

ALWAYS MAKE SURE THE HIGH VOLTAGE INDICATOR IS OFF WHEN CONNECTING OR DISCONNECTING THE SPECIMENS.

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A. PRESENTATION

Since 1970, one of the major occupations of our team has been to design and manufacture wiring testers. Our experience in this field has been recognised by most companies using leading-edge technologies in military, aeronautic and civilian fields.

Testers in the **SYNOR 4200** series all have the same architecture: a PC-compatible CPU connected via an opto-isolated interface to a measurement unit and relay-matrix switching unit capable of receiving modules of 500 V to 2000 V.

This combination of technologies provides high-performance insulation measurement and a test speed easily compliant with the conditions required for the most sophisticated wiring.

A suite of user-friendly, interactive software operating in WINDOWS® environment makes the tester easy for the operator and programmer to use.

To maintain compatibility between all generations of our testers, transfer software allows the test programs of this instrument to be used on **SYNOR 4200** instruments, and vice versa. Upward compatibility between **SYNOR 3400** and **SYNOR 4200** is guaranteed.

A.I HOW TO USE THIS MANUAL

If you have never used a **SYNOR** wiring tester, read the general information at the beginning, through to "File management".

After this, using a straightforward wiring arrangement on which you can create faults (such as a dummy box), practice with the tester, referring to the "Operating instructions" and the "Analysing the error list" instructions for help.

Finally, you should read the "Programming instructions" and transcoding information to gain total control of the system.

If you are already familiar with older generations of **SYNOR** testers, you should read "Programming instructions", but it will be useful to read all the manuals.

If you have to train operator level personnel, use the "Operating instructions" and "Analysing the error list".

Finally, if you are short of time, or your usual operator is absent, use the "Operating instructions".

***WARNING**: A device of this kind is designed to improve quality: it cannot therefore be used without a basic minimum of training.*

A.II THE CHAPTERS

Each tester is delivered with a manual containing four sections:

- General information,
- Instructions for analysing the results,
- Programming instructions,
- Operating instructions.

In addition, there are instructions concerning the PC and the use of WINDOWS® (not supplied by **SEFELEC**).

The "GENERAL INFORMATION" gives all the information concerning setting up, building the interfaces and using the tester.

The section "ANALYSING THE ERROR LIST" gives the examples of the frequent test situations.

The "PROGRAMMING INSTRUCTIONS" explain the syntax and means required to produce the test program.

The "OPERATING INSTRUCTIONS" explain the various possibilities of the WINPASS software for each function. This is done using straightforward examples and screen copies. This manual should be read in front of the tester screen.

The "GENERAL INFORMATION" must be understood before going any further. The "PROGRAMMING INSTRUCTIONS" are not essential reading for the user, who probably only needs to understand the section "ANALYSING ERROR LISTS". The technician will need a thorough understanding of all the information.

A.III CONCLUSION

We hope that the following pages contain a maximum of information expressed as clearly as possible. However, despite our efforts, this manual may have its faults, because it is difficult to write a document that addresses all levels and condenses all the possibilities of a multiple-resource system.

We would therefore be pleased to hear your opinions and criticisms so that we can improve the text. At the same time, our technicians are always available to answer your questions or refresh your training.

This document is available, updated, on our Internet site: http://www.sefelec.com

B. GENERAL INFORMATION

B.I CHARACTERISTICS

B.I.1 BASIC VERSIONS

The basic versions of the **SYNOR 4200** are made up as follows:

- a common measurement unit
- a set of software utilizing Microsoft WINDOWS®
- a central processing unit based on a PC
- facilities for mixing 500 V and 2,000 V modules of access to points

The **SYNOR 1202**:

"Small table-top tester" supplied in a case, limited to 256 points at 500 V or 128 at 2,000V. The PC is external. This instrument is not extensible.

The **SYNOR 4202**:

Tester supplied in case but with external PC, without terminal or front-insertion printer.

- This tester can be equipped with 16 switching matrix modules;
- Additional racks of 16 modules can be connected.

The SYNOR 4203:

Identical tester to the SYNOR 4202 but supplied in a cabinet and able to receive up to 384 switching cards, i.e. 49152 points at 500 V or 24576 points at 2000 V.

The SYNOR 4204:

Tester resulting from modernization of SYNOR testers of the previous generation (SYNOR 9400, SYNOR 3400...).

It is equipped with the same basic constituent elements as the 4200 (measurement and software); only the switching matrix units of these older versions is kept.

The SYNOR 4207/4208 :

Basic SYNOR 4200 tester to which a unitary-relay switching system has been added. The SYNOR 4207 is the "case" version of the SYNOR 4208 cabinet model.

The SYNOR 4209 :

Basic SYNOR 4200 tester, designed to test large-dimension wiring as found in railway, automotive and aeronautic systems.

The central measuring unit of this tester is in a cabinet containing the PC with its screen, keyboard and printer.

The switching matrix is in units powered by the central processing unit. This allows the tester assembly to be arranged around the item to be tested and thus reduce the number of connection interfaces.

B.I.2 THE COMPATIBLE PC:

According to the version, this may or may not be built into the tester box (rackable industrial PC).

To create "transcoding" and test files, it is possible to use a programming station to enter the different data without monopolizing the tester. Nevertheless, the tester can perform both these functions on its own.

The PC, whether or not it is incorporated, is insulated electrically from the measurement unit and the switching matrix, to which it is connected by a special cable. An optical barrier separates the two assemblies in order to ensure a high degree of immunity from noise.

The external PC must operate on WINDOWS® 2000 or XP. The interface uses a "PCI" slot.

The software:

The TESTER includes the "test" function, accessible to any operator if the test file exists. The "self test" function is accessible under the same conditions. The "autoprogram" function enables spontaneous learning, by the tester, of wiring for which no test program exists.

The sensitive functions (file modification and manual operations on the measurements) are protected by a configurable password.

The Editor is used to write and modify test files and transcode them. It includes a checking function to identify any errors of syntax that may have crept into a test program.

The sensitive functions (file modification and manual operations on the measurements) are protected by a configurable password.

The measurement unit:

This comprises the following functions (depending on options):

- Measurement of insulation resistance,
- Measurement of dielectric strength DC (Hipot DC measurement)
- Measurement of dielectric strength AC (option),

- Measurement of continuity, 2 wires. This measurement is used to detect microbreaks,
- Measurement of continuity, 4 wires (Kelvin methode).
- Measurement of capacitances,
- Measurement of shielding,
- Measurement of diodes,
- Measurement of resistances with protection point,
- Detection of transients,
- "GO NO GO" production test,
- Measurement of self inductance (option),
- Measurement of inductances (option),
- A stimulus generating system can be adapted to the tester.

TABLE OF THE DIFFERENT PROGRAMMABLE PARAMETERS (* =option)

MEASUREMENTS	PARAMETERS	MIN. VALUE	MAX. VALUE	ACCURACY
CONTINUITY				
2 wires	R min	0 Ω	250 Ω	± 5 %
	R max	0 Ω	250 Ω	± 5 %
	Courant	10 mA	2 A	± 5 %
	Voltage	5 V	20 V	± 5 %
	Time	5 ms	99 s	± 1 ms or 1 s
4 wires (Kelvin methode)				
	R min	10 mΩ	250 Ω	± 5 %
	R max	10 mΩ	250 Ω	± 5 %
	Current	10 mA	2 A	± 5 %
	Voltage	5 V	20 V	± 5 %
	Time	3 ms	99 s	± 1 ms or 1 s
INSULATION	Resistance	50 kΩ	2000 MΩ	± 5 %
	DC voltage	20 V	500 V	± 5 %
		20 V	2000 V	± 5 %
	Rise time	10 ms	99 s	± 1 ms or 1 s
	Application time	10 ms	99 s	± 1 ms or 1 s
	Breakdown	500 µA	10 mA	± 10 %
DIELECTRIC				
STRENGTH *	AC voltage	50 V	1500 V	± 5 %
	Rise time	500 ms	99 s	± 1 ms or 1 s
	Application time	20 ms	99 s	± 1 ms or 1 s
	Breakdown	500 µA	10 mA	± 10 %
DIODES	Current	10 mA	2 A	± 5 %
	Voltage	100 mV	20 V	± 5 %
ZENERS	Test voltage	20 V	100V	± 5 %
	Zener voltage	20 V	90 V	± 5 %
RESISTORS				
2 wires	Resistance	10 Ω	10 MΩ	± 5 %
	Time	3 ms	99 s	± 1 ms or 1 s
4 wires (Kelvin methode)	Resistance	100 mΩ	10 MΩ	± 5%
	Current	1 µA	10 mA	
SHIELDING	Capacitance	50 pF	1 µF	±5 pF ± 5 %
DC CAPACITORS	Capacitance	100 pF	100 000 µF	±5 pF ± 10 %
AC CAPACITORS *	Capacitance	100 pF	2 000 µF	±5 pF ± 10 %
INDUCTION COIL*	Self-induction	100 µH	200 H	± 5 %

The tolerance values are given for the read or programmed value, as the case may be. These are guaranteed values on the measuring unit but the connection interfaces have a considerable effect on measurement quality.

The switching matrix:

The switching matrix is the element which brings the points on the wiring to be tested under measurement. This switching matrix works by means of relays, giving it high performance on insulation and voltage.

The technology selected is the REED relay. these components provide high commutation speed (300 µs) and very high insulation (>10^{12} MΩ), enabling thousands of points to by commuted in parallel and at a very high voltage (2150 V).

Two possibilities are available in application of this principle:

- A switching matrix with 4 contacts allowing all types of measurement (between two points or by nets) except for tests between groups of points.
- A unitary-relay switching matrix provides the additional possibility of testing one net against all the other points connected to the earth (standards GAM-EG-13, RC AERO 54335, PR EN 2283, NF F 67-001-5 Dec. 91) and testing between groups of points.

B.I.3 OPTIONS

We shall restrict ourselves here to a list of these options, each of which is the subject of a specific manual.

- measurement of dielectric strength under alternating voltage programmable between 20 V and 1500 V. The breakdown detection threshold is programmable between 500 µA and 10 mA.
- measurement of inductance: 10 µH to 10 H
- measurement of impedance:
- low level measurement: continuity and insulation at 200 mV
- control of relays

B.II CONDITIONS OF OPERATION

B.II.1 ENVIRONMENT

A wiring tester is an instrument for carrying out several types of measurements, and imposes certain constraints due to the laws of physics.

Measurements of continuity can only be significant if no obstacle is presented by interfaces (bad contacts, high resistances, defective insulation, etc.).

Measurements of high insulation require an environment of controlled humidity (55% at 20°C), both for the tester and the material to be tested. Dust filters enable it to be used in an ordinary wiring workshop. For work in places such as sheds which are frequently open to the outside, or in difficult environments, the interior of the tester can be air conditioned, on demand.

Finally, if the electronic systems are to work properly, an ambient temperature within the range 15°C to 30°C is required. The air intakes of the instrum ent must be kept clear.

B.II.2 CONNECTION TO THE MAINS SUPPLY

The tester must be connected to a 230V 50Hz single phase supply. A switch controls supply of power to the whole instrument. The PC may have a separate power supply in the case of the **SYNOR 4202**. Where a tester comprises more than one cabinet, each one has its own mains supply cable.

The plugs are 16A single-phase + earth and must be protected by a 16A magneto-thermal circuit breaker and a differential of 30mA minimum.

The use of a specific measurement earth is recommended (impedance < 3Ω).

In regions where the power supply is subject to disturbances (microbreaks, noise, etc.), an uninterruptible power supply is recommended, especially for the PC. Maximum permissible deviation is ± 15%.

To sum up:

- Humidity 55% at 20°C;
- Temperature 15°C to 30°C;
- Storage temperature: – 10°C to + 60°C
- 230 V mains supply (± 15 %) 50 Hz (60 Hz possible on request)
- Earth < 3 Ω, microbreak < 10 ms
- Atmospheric conditions (dust), ordinary wiring workshop.

Power consumption:

- PC about 200 VA (depending on type);
- Central unit 300 VA;
- Back panel giving access to points 300 VA.

B.II.3 ERGONOMICS OF THE WORKSTATION

The tester is supplied as the instrument alone. On demand, furniture can be supplied or recommended.

The user must be able to move around the equipment to be tested, but without losing sight of the screen.

Programming can be carried out on a micro-computer installed in quieter surroundings.

With the SYNOR 1202 version in a case, the tester can be set up on the work table, for capacities less than 256 points at 500V.

B.II.4 SAFETY OF PERSONNEL

The voltages and currents employed in a wiring tester and in the wiring itself can be dangerous if touched.

The voltages and currents present in the wiring tester and in the wiring itself, may be dangerous if touched. Personnel protection is the responsibility of the site where the tester is installed. SEFELEC can only provide recommendations: the safety manager of the company using the device must ensure that safety requirements are met.

The effects of a current passing through the human body are described in the text of EN 50191 of 20 January 2003. This text applies to the "*Installation and operation of electronic test equipment".*

B.II.4.1 Safety loop

From October 2007, a **double safety loop** will be integrated into testers allowing compliance with standards EN 61010-1, EN 60204-1, EN 954-1 and EN 5019, either directly or with the addition of external accessories (emergency circuit-breaker, safety barrier, light signalling, etc.).

See the connector wiring for implementation.

This double loop acts by electromagnetic break in high voltage generators as soon as one of the loops is cut or earthed. The software reacts by displaying a warning message and stopping the test sequence. The test can only start running again if the loops are closed and the operator gives the order.

B.II.4.2 Parts which are dangerous to touch

It is taken as a point of departure that the human body possesses a non-inductive resistance approaching 2 kΩ.

B.II.4.3 Alternating current

1/ for voltages up to 25 V:

a current of 3 mA

B.II.4.4 Direct current

1/ for voltages up to 60 V:

a current of 12 mA

The discharge energy must never exceed 350 mJ.

NOTE: *A current peaking at a maximum of 0.7 mA, although not dangerous in any way, is perceptible by certain people.*

B.II.4.5 Optimization of safety on the SYNOR 4200

The **SYNOR 4200** reacts to a variation in current:

If the operator is in contact with the wiring, the generator is inhibited and the energy stored in the wiring is discharged through a 1 kΩ resistance.

The continuity generator does not exceed 20 V DC.

The high voltage DC generator is limited to 5 mA.

The high voltage AC generator is limited to 5 mA rms.

The system of protection applies both to the equipment under test and to the operator; it is independent of the voltage applied and of the current injected for measurement purposes.

NOTE: *When the generator is inhibited, the switching matrix remains in the same position as upon occurrence of the incident for 20 ms in order to ensure complete discharge of the wiring under test.*

B.II.4.6 To summarize:

access to the tester must be restricted to personnel "made aware of electrical hazards". It is strongly recommended not to handle the equipment being tested (risk of faults and electric shocks). A safety loop is proposed on testers fitted with the high voltage AC option.

For voltages greater than 1000 V, suitable signalling (available as an option) must be set up.

B.II.5 MAINTENANCE OF THE INSTRUMENT

1 PRELIMINARY

Our warranty (refer to the beginning of this manual) attests the quality of materials and workmanship in our products. If malfunction should be suspected or other information be desired call our technical assistance: (33) 1.64.11.83.40 for FRANCE or contact your local distributor.

2 INSTRUMENT RETURN

Before returning an instrument to our Service Department, please call them at the above phone number for shipment instructions.

Use packaging that is adequate to protect it from damage.

3 MAINTENANCE

Our units don't need particular maintenance except an annual calibration. If problems, please follow the brief check list here after. If the problem continues, call our service department at the above number.

The other possibilities for a bad functioning need an intervention inside the unit by qualified people. However we can supply a service manual including schematics of our units. Please get in contact with our Service department in order to know price and delivery time.

4 CALIBRATION

We recommend to calibrate our units each year. The calibration must be performed by qualified people having the complete procedure as well as correctly checked standards. Our Maintenance department is at your service to perform the annual calibration. Please get in contact with our Maintenance department in order to know the price and the delivery time.

5 Cleaning and checking

Only clean the instrument with a mild rag or slighly soaked with water.

Our own teams are specially qualified for the checking and periodic maintenance of the tester.

However, the cleaning services should be responsible for cleaning and changing the dust filters (according to model), and keeping the ventilation apertures of the instrument clear. In dusty environments, it is advisable to clean the interior of the apparatus from time to time with a vacuum cleaner (compressed air must not be used).

In workshops with cold floors, or which are washed with water, it is advisable to install the tester on a pedestal to limit condensation.

The electronic operation of the apparatus is checked in the following cases:

a - Automatically: when the functions TEST, AUTOPROGRAM or SELF TEST are called up, by a check of the measurement units;

b - On demand: by running the SELF TEST to check the relays of the switching matrix

c - During the tests: by analysis of the coherency of the measurements.

d – It is advisable to verify the test parameters twice a year.

After this period, we cannot guarantee the accuracy of measurements and correct operation of the equipment components.

Frequency:

Weekly	or at each “self programming”	SELF TEST
Long shutdown		SELF TEST
Monthly		CLEAN FILTERS
Yearly		CHECK MEASUREMENT PARAMETERS
Yearly		CLEAN TESTER

It is also advisable to make a backup copy of the system disks on a medium other than the hard disc of the PC used with tester.

B.II.6 PRECAUTIONS DURING USE

The tester must never switch or receive external electrical power supplies that it does not control via its own software. Such power supplies include induction coils not fitted with "free-wheel diodes" or capacitors that are not discharged. The "**external output"** must not be used as a generator switch.

As the SYNOR tester is a measuring instrument, SEFELEC cannot be held liable, under its guarantee or otherwise, for any damage to the device or lost production resulting from failure to comply with the operating conditions set out above (environment, mains power supply and utilization conditions).

The tester is fitted with an **"external output"** function that can be programmed to connect two programmed points to a connector on the front panel. An external measuring instrument can be connected to this for specific measurements or troubleshooting. However, the following conditions must be observed:

- The external device must **NEVER** exceed the **MAXIMUM VOLTAGE** and **CURRENT** values permissible on the relays of the tester.
- Dielectrimeters and breakdown meters are **STRICTLY FORBIDDEN**.
- The "**external output"** must not be used as a generator switch.
- Any external power supply is forbidden as the routing relays are unable to switch it.
- In the case of an **external output** on a multiple insulation test, all or some of the points are short-circuited because the relays remain in place. Select STOP TEST to look for a fault on the equipment with an ohmmeter.

B.II.7 RELAYS CONTAINING MERCURY

You are reminded that to guarantee high-quality performance from our instruments, we use mercury relays for some of our functions. European Directive 2002/95/EC of 27 January 2003 concerning the restriction of certain substances for electrical and electronic equipment (ROhS) and European Directive 2002/96/EC of 27 January 2003 concerning waste from electrical and electronic equipment (WEEE) stipulate that from 1 July 2006 the use of mercury is restricted only for equipment relating to food (electrical household appliances), medical applications and toys. Industrial equipment is not concerned.

B.III PRINCIPLE of operation

B.III.1 GENERAL PRINCIPLE

The role of the PC is to dialogue with the operator. It is used to process, store and read the test programs. It sends test commands to the measurement unit and the switching matrix.

The latter then selects the points to be tested in the wiring system under test and connects them to the measurement unit.

The results are sent to the PC, which processes them.

B.III.2 THE SWITCHING MATRIX

The switching matrix is a steering device composed of REED relays which chooses points in the wiring system to be tested and links them to the measurement units.

Every point tested is either the departure point or the arrival point of a measurement. In order that any terminal of the tester may be connected at will, it is necessary to associate two contacts with it, directing each point to the hot point (point A) or the cold point (point B) of the measurement.

The measurement and control bus of this switching matrix allows up to 49152 test points to be connected at 500 V. This is possible because of the modular construction of the equipment.

This means that the smallest tester has only one module. As the modules are identical, only their geographical position determines their address. The racks are identical (in the case of SYNOR 4203), but switches allow them to be addressed individually.

The equipment is specially designed to allow two types of module to be combined in the same tester, provided that the same technology is used (multi or mono-contact relays).

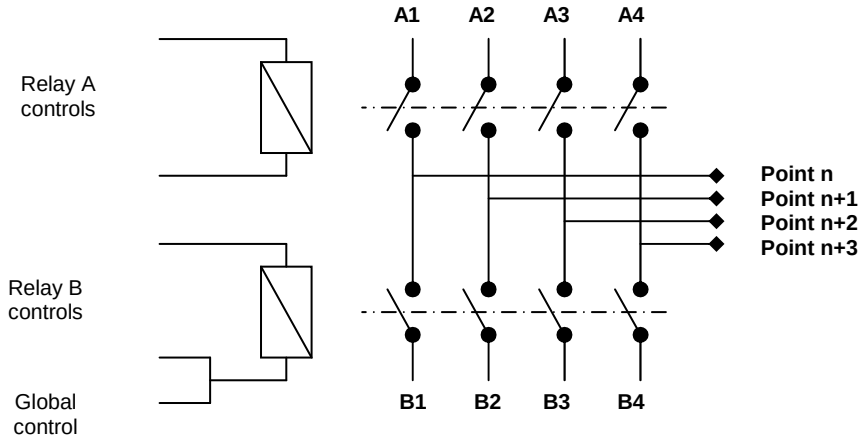
Each rack has its mains power supply and control interface, allowing the CPU to control any number of backplanes without modification. Extensions are possible on any basic version.

The address of each point is given by the position of the tester output terminal. This position is unchangeable in each rack. The first card is always located on the left of the rack seen from the output side.

Two types of switching system are available:

a – Switching matrix with multiple relays

To simplify operation by reducing the number of bus command signals, and to reach a compromise between cost and size, the relays have 4 contacts. This makes it necessary to bring two measurement buses with 4 wires (Kelvin methode) each into the tester. "Unitary" relays will select the unit requested. However, this system makes "4 wires (Kelvin methode)" operation possible without much modification of the interface, but respecting the "odd-even layout".

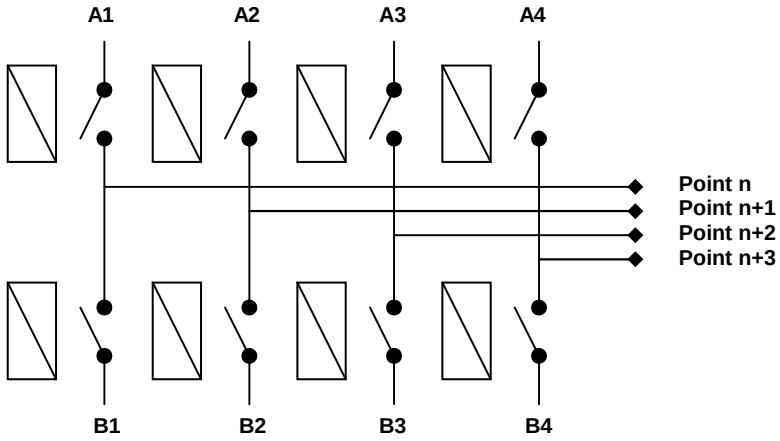


This switching matrix is available either in modules of 128 points accepting a current of 2A and a voltage of 500 V and equipped with 2 type 41 612 – 64 point connectors, or in modules of 64 points accepting 2A and 2000 V equipped with 2 type 41 612 – 32 point connectors.

b – Switching matrix with unitary relays

Another switching matrix is also available. It is made up of unitary relays giving greater testing flexibility with unlimited combinations.

It is equipped with unitary relays accepting 2A - 2000 V.



This switching matrix can test a net with respect to lower ranking addresses or one point among others. The second switching matrix can also test a net among all the other points.

This switching matrix is ideal for functional tests because any points in a wiring system can be routed or protected if they are likely to be damaged or impede the test.

B.III.3 THE TEST

Two major families of tests are possible by the positioning of the switching matrix de commutation: the test between two points and the multiple test measuring one point with respect to a group of points.

B.III.3.1 The test between two points:

The switching matrix chooses 2 points in the wiring and directs them towards the measurement unit. By programming, it is possible to choose the hot point and the cold point.

This configuration can be used for all measurements.

Measurement of continuity consists in injecting a programmable current and measuring voltage and current at the terminals of the resistance to be tested. Ohm's law will give the exact value.

Measurement of continuity by 4 wires (Kelvin method) divides the switching matrix into two internal buses, the first directing the test current, the second conveying the voltage of the terminals of the element under measurement. Even-addressed points are allocated to the SENSE of the measurement, odd points to injection of the current. This arrangement is possible throughout the switching matrix and can be combined with 2-wire tests (see appendix).

Measurement of resistances covers measurements from 10 Ω to 10 MΩ in two wires, using currents of 1 µA to 10 mA. It is possible to program the time in order to charge the condensers in parallel.

With 4 wires (Kelvin methode), it is possible to measure resistances from 100 mΩ to 10 MΩ. The system of measurement chooses its ranges of current automatically (1 µA to 10 mA). It is obvious that for lower values, the accuracy and resolution is less good than at strong currents (see continuity, 4 wires). However, for fragile components unable to support such currents, it is preferable to use this mode of measurement.

Measurements of continuity and resistances can work with two types of calibration. The first is automatic (see "configuration"); it consists in measuring the internal resistance of the tester and bringing it down to the measurement. The second consists in entering in the test programme the value of the interconnection interface, which will then be adjusted to the measurement. This will thus give 0 Ω at the input connectors of the equipment to be tested.

Measurement of diodes enables injection of a current of 10 mA to 2A into a diode and measurement of the voltage at its terminals. It is possible to measure diodes from 100 mV to 20 V (this measurement is performed in 2-wire mode).

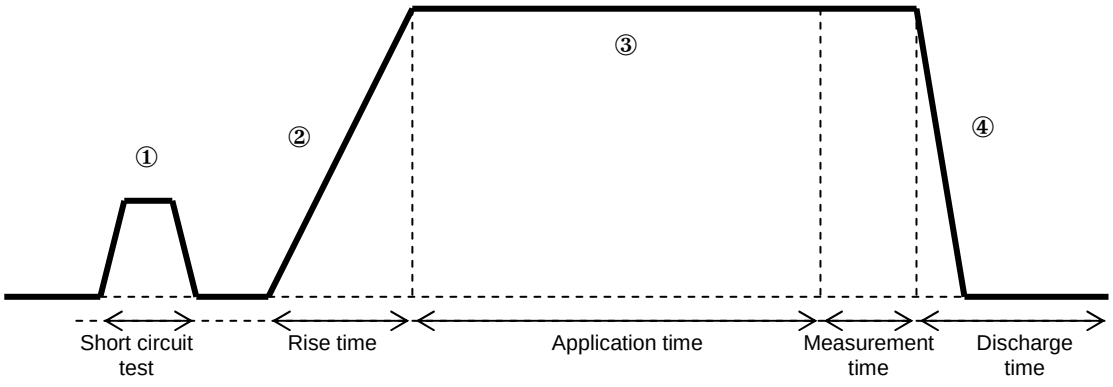
A second range of 20 V to 90 V operates with a test voltage of 20 V to 100 V. The generator used is limited to 5 mA.

Measurement of insulation combines several functions. It can perform**:**

- measurement of insulation resistances from 50 kΩ to 2000 MΩ at high voltage (20 V to 2000 V, depending on the switching matrix).
- measurement of dielectric strength and detection of short circuits.

This measurement proceeds as follows:

- An initial test at low voltage (continuity measurement) to detect any short circuit (1). If a short circuit is found, the test stops (the message SHORT CIRCUIT appears in the error list).
- If there is no short circuit, the high voltage is applied. During the programmable rise time (2), if breakdown occurs, the voltage is displayed and the test stops (the breakdown voltage is given in the error list)**.**
- If no breakdown occurs and if the voltage does not reach the required value (±10%), the message U<Uprog appears in the error list.
- Next, the voltage is applied for the duration of the programmed application time (3). If breakdown occurs during this period, the moment when the fault appears is displayed in the error list and the test stops.
- Lastly, if all goes well, at the end of the application time (4), the insulation resistance is measured. The tester will add a measurement time as a function of the range requested. The measurement time varies from 20ms to 240ms according to range.
- To end the sequence, the tester reduces the high voltage and then discharges the unit tested to an earth resistance (total time 20ms). This procedure is identical at the end of every measurement of insulation.



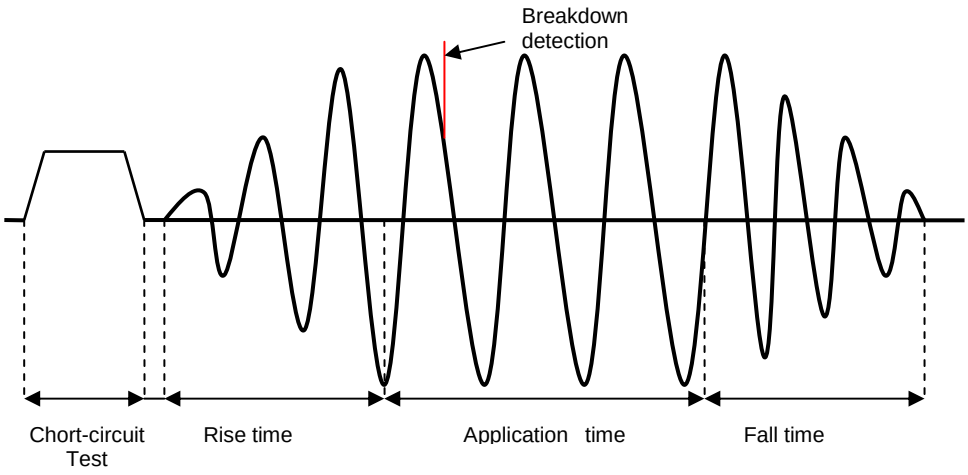
The test of dielectric strength detects any sudden variation in the increase of the test current outside the programmed limit.

The short circuit test or high voltage test can be programmed out of the test.

Measurement of dielectric strength under alternating current is performed using an alternating voltage (50Hz) adjustable to an effective 50V to 1,500V. As is the case with direct current, it detects any sudden rise of current up to a programmed threshold.

The short circuit test is maintained by default. The rise time is more than 500 ms and the application time at least one period.

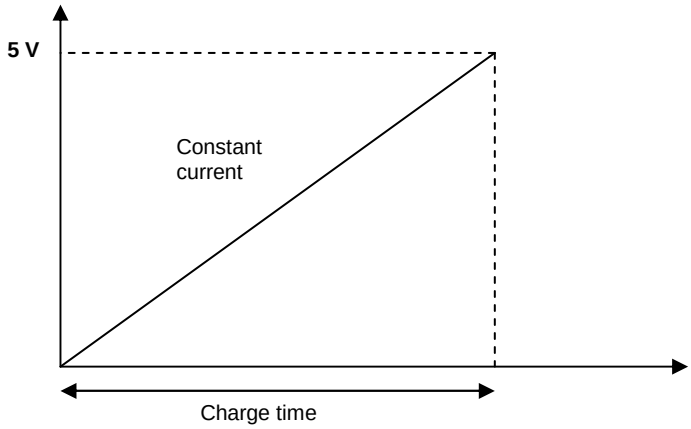
Warning: The test under alternating current is penalised by the capacitive value of the tested equipment. It must be remembered that the generator power is limited to 5 mA.



Measurement of capacitance and shielding is a measurement that eliminates eddy currents allowing fine measurement with good resolution.

Measurement of shielding ranges from 100 pF to 10 µF; it uses an adjustment system allowing interfering capacitors introduced by the tester and interface to be eliminated.

Capacitor measurement ranges from 100 pF to 100,000 µF. A more powerful current generator is available for stronger capacitors. Adjustment is also possible.



B.III.3.2 The multiple test:

- With the 4-contact switching box:

The switching matrix positions the weakest address point of a net on the "hot point" side of the measurement.

On the "cold point" side are brought together all the address points lower than the hot point.

The process is carried out in a single operation, with no scanning, so that the test of point 5 will take the same time as that of point 5,000, for example. This advantage was made possible by the choice of the relay technology of the switching matrix.

The measurement unit then determines the resistance between one point and a group of points. In case of a defect, a search is carried out to determine which points are really defective, in order to facilitate repairs.

There is only one constraint on this procedure: it forces all the net points to appear in the test programme; the defect, however, will appear once only, thus weeding the error list (see "analysing results").

- With the unitary relay switching box:

This switching matrix is able to direct each point independently either to the cold point or to the hot point of the measurement. In this way, it is possible to test a net among all the other points, but also to prevent the tester from obtaining access to certain points (fragile components, relay switching, etc.).

B.III.3.3 Special features:

As mentioned earlier, the test between 2 points is accessible by programming to all the measurement units (standard measurements and all the options). The choice of the hot point is possible in all these cases (see "Programming Instructions"). In case of defects, the type of measurement, the names of the points concerned and the value measured are all given.

On the other hand, in multiple tests, 2 possibilities are available:

- either a high impedance, high voltage insulation test using the insulation unit;
- or a low impedance, low voltage "non-continuity" test using the continuity unit. The second case provides for a search for short circuits on assemblies incapable of supporting high voltages.

When a net is tested in isolation, if a break occurs, the test is no longer valid for the second part, isolated by the break. Automatically, the tester repeats an insulation test on the second part.

This means that it is not necessary to repair the breaks to discover all the insulation defects. The tester will locate all the faults in a single operation.

In case of defects, the type of measurement, the names of the different defective points and the value measured are all given.

B.III.4 SELF LEARNING

This enables the tester itself to create the test programme for a wiring system connected to it. It uses the switching matrix and the continuity unit to explore the wiring and identify all the nets.

This exploration takes place within a zone of points determined in advance by the user. Provided the points within this zone are connected to points located outside it, the nets will still be identified in their entirety.

Since the function of the SYNOR 4200 is to test wiring, basic self learning is only possible on nets. The presence of components (resistances, diodes, condensers, etc.) could lead to false interpretations.

To warn the user of defective programming due to components or bad contacts, during self learning the tester gives the number of points listed more than once, or never listed.

It is easy to compare these data with the wiring documents and carry out a quick check to make sure that no gross errors have crept into the test programme.

WARNING: *However many precautions may be taken when carrying out self learning, some risk that an error of connection or a bad contact will induce an error of programming will inevitably remain.*

The resulting file must always be compared with the wiring documents, bearing in mind that it is very much quicker and less tedious to compare and modify a test programme than to write a whole program by hand.

B.III.5 SELF TESTS

As we mentioned in the chapter on maintenance, the tester possesses two types of self test: automatic self tests and self tests on demand.

B.III.5.1 Automatic self tests:

As soon as the tester is switched on, or a when a function (test, self learning or self test) is initialized, the measurement units used by the function called are automatically tested.

In addition, at each measurement, the voltages and currents applied are compared with the value measured. In the event of a difference or an inconsistency (low voltage in an open circuit, for example) an error message is displayed.

The following messages are blocked

Acquisition system failure - Acquisition system fail GAIN

This message indicates that there is no dialogue between the tester and the PC.

Check that:

The tester is switched on (mains supply present, 4A fuse correct, etc.)

The tester - PC connection cable is correctly connected.

Measuring card 40372 is correctly installed on the backplane and the flat bus ‘info’ cable is properly connected.

Cards 40403 and 40404 are correctly installed on the backplane and the flat bus ‘info’ cable is properly connected.

Current generator failure

Check that:

Measuring card 40372 is properly connected.
Relay contacts K15, K16 and K17 for routing card 40403, are open.

DC voltage generator failure

GoNoGo – Microbreak measurement failure

Insulation – Breakdown measurement failure

Check that:

HV generator card 40371 is properly connected.
Fuse F1 (100mA) has not been tripped.
Relay contacts K15, K16 and K17 for routing card 40403, are open.

Insulation measurement failure – Insulation voltage generator failure

The following messages are not blocked

Capacitance measurement failure

Check that:

Measuring card 40372 is properly connected.
Relay contacts K15, K16 and K17 for routing card 40403, are open.

Resistance measurement failure

Check that:

Measuring card 40372 is properly connected.
Relay contacts K15, K16 and K17 for routing card 40403, are open.

All these precautions make the tester extremely reliable in the quality of its results.

B.III.5.2 Self tests on demand:

These self tests are designed to check the switching matrix. As this operation takes a relatively long time, it cannot be performed automatically.

Furthermore, it does not entail unavoidable errors of interpretation prejudicial to the proper operation of the tester.

These self tests must always be used before any self learning operation, after a prolonged stoppage of the tester or in any case of doubt.

Their function is to check that all the relays of the switching matrix open and close properly.

4 tests are performed on each point. Each of the 2 contacts is tested open, then closed.

The point is then tested for insulation from lower ranking points. This last test is designed to assess the insulation of the apparatus, the preliminary tests having eliminated any doubt regarding the mechanical operation of the relays.

Switching failures are indicated by the self test after the switching matrix parameters and components are displayed.

Unitary relay tests:

Closing fault on AU or BPU n

Relay n unit A or Relay n unit BP does not close. There are four AU unit relays and four BPU relays.

See relays K1 to K4 and K6 to K9 on card 40403.

Closing fault on BU n

Relay n unit B does not close. Each BU has four unit relays.

See relays K11 to K14 on card 40403.

Opening fault on AU n

Relay n unit A remains closed

Opening fault on BU n

Relay n unit B remains closed

Opening fault on BPU n

Relay n unit BP remains closed

The fault is detected using an ohmmeter between the contacts of these relays (see table below). They must all be open when de-energized.

Tests on switching cards 40418

Closing fault on A n

Closing fault on A n+1

Closing fault on A n+2 etc.

These four faults indicate a failure of an A relay coil (coil, diode or filter cut off).

Closing fault on B n

Closing fault on B n+1

Closing fault on B n+2 etc.

These four faults indicate a failure on a B relay coil (coil, diode or filter cut off)

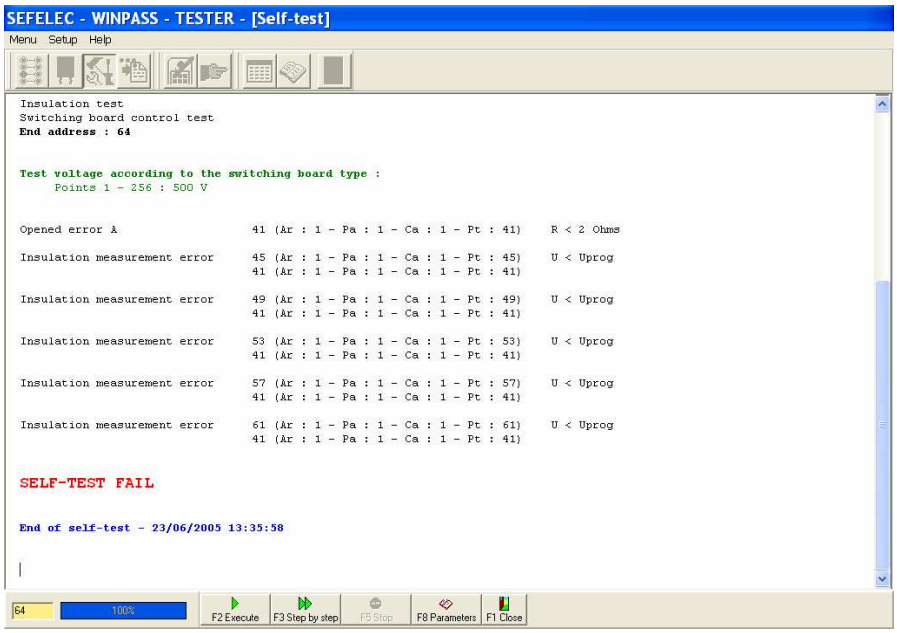
Closing fault on A n or

Closing fault on B n

These two faults indicate that the A or B contact with address n does not close.

Opening fault on A n

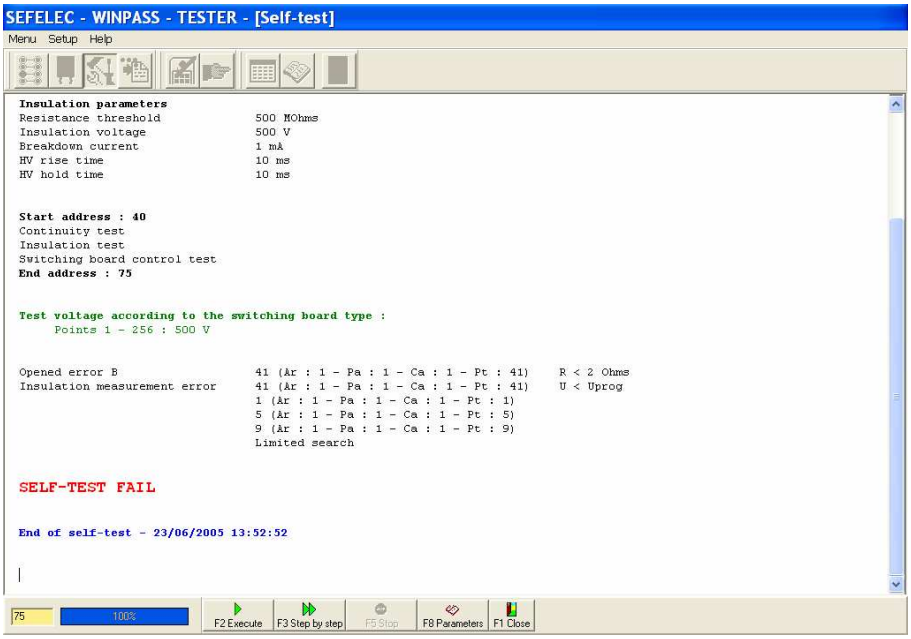
This fault indicates that the A contact with address n remains closed. This message is always displayed with a series of insulation faults on the higher upper points, modulo 4. This is because bus A is forced to the same line. This fault drops on changing to a new module (cut-off relay). Only the first error message must be taken into account.


SEFELEC - WINPASS - TESTER - [Self-test]
Menu Setup Help
Insulation test
Switching board control test
End address : 64
Test voltage according to the switching board type :
Points 1 - 256 : 500 V
Opened error A 41 (Ar : 1 - Pa : 1 - Ca : 1 - Pt : 41) R < 2 Ohms
Insulation measurement error 45 (Ar : 1 - Pa : 1 - Ca : 1 - Pt : 45) U < Uprog
41 (Ar : 1 - Pa : 1 - Ca : 1 - Pt : 41)
Insulation measurement error 49 (Ar : 1 - Pa : 1 - Ca : 1 - Pt : 49) U < Uprog
41 (Ar : 1 - Pa : 1 - Ca : 1 - Pt : 41)
Insulation measurement error 53 (Ar : 1 - Pa : 1 - Ca : 1 - Pt : 53) U < Uprog
41 (Ar : 1 - Pa : 1 - Ca : 1 - Pt : 41)
Insulation measurement error 57 (Ar : 1 - Pa : 1 - Ca : 1 - Pt : 57) U < Uprog
41 (Ar : 1 - Pa : 1 - Ca : 1 - Pt : 41)
Insulation measurement error 61 (Ar : 1 - Pa : 1 - Ca : 1 - Pt : 61) U < Uprog
41 (Ar : 1 - Pa : 1 - Ca : 1 - Pt : 41)
SELF-TEST FAIL
End of self-test - 23/06/2005 13:35:58
64
100%
F2 Execute
F3 Step by step
F5 Stop
F8 Parameters
F1 Close

Opening fault on B n

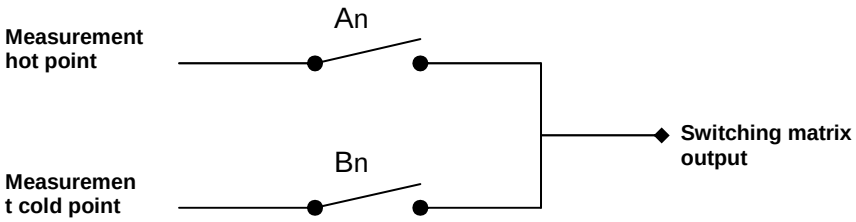
This fault indicates that the B contact with address n remains closed. This message is always accompanied by a single opening fault with the corresponding modulo 4 unit.

Example opening fault 41 with 1, 5, 9 etc.

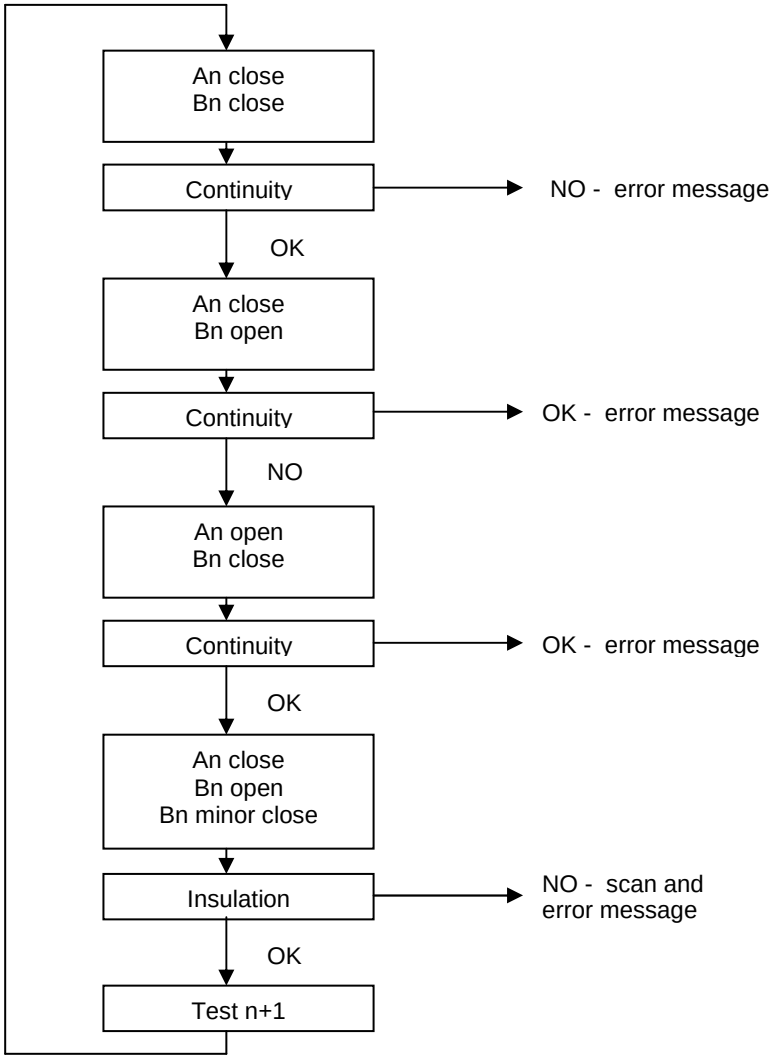

SEFELEC - WINPASS - TESTER - [Self-test]
Menu Setup Help
Insulation parameters
Resistance threshold 500 MOhms
Insulation voltage 500 V
Breakdown current 1 mA
HV rise time 10 ms
HV hold time 10 ms
Start address : 40
Continuity test
Insulation test
Switching board control test
End address : 75
Test voltage according to the switching board type :
Points 1 - 256 : 500 V
Opened error B 41 (Ar : 1 - Pa : 1 - Ca : 1 - Pt : 41) R < 2 Ohms
Insulation measurement error 41 (Ar : 1 - Pa : 1 - Ca : 1 - Pt : 41) U < Uprog
1 (Ar : 1 - Pa : 1 - Ca : 1 - Pt : 1)
5 (Ar : 1 - Pa : 1 - Ca : 1 - Pt : 5)
9 (Ar : 1 - Pa : 1 - Ca : 1 - Pt : 9)
Limited search
SELF-TEST FAIL
End of self-test - 23/06/2005 13:52:52
75
100%
F2 Execute
F3 Step by step
F5 Stop
F8 Parameters
F1 Close

Note: *To optimise the self test time, the short circuit test is not carried out. Consequently, a short circuit will be detected by the high voltage generator which will display the message U<Uprog. Likewise, a relay fault impedes the operation of the search algorithms and often the message "point not found" or "test earth" is given after the search: this should be ignored***.**

B.III.5.3 Organization of a point in the switching matrix:



B.III.5.4 Organization chart of the switching matrix self test:



The insulation test provides a general picture of the insulation of the tester. Indeed, the relays may work perfectly, but bad humidity or poor cleaning of the instrument may cause a drop in quality of the insulation of the whole tester.

It is necessary to be aware of this, so that either the environment of the tester can be modified (interfaces, humidity of the premises, etc.), or the parameters of test can be lowered.

NOTE: *It is impossible to perform this self test without disconnecting the wiring to be tested, but it is advisable to leave the interface, as the insulation test performed during the self test can give useful information about its condition*.

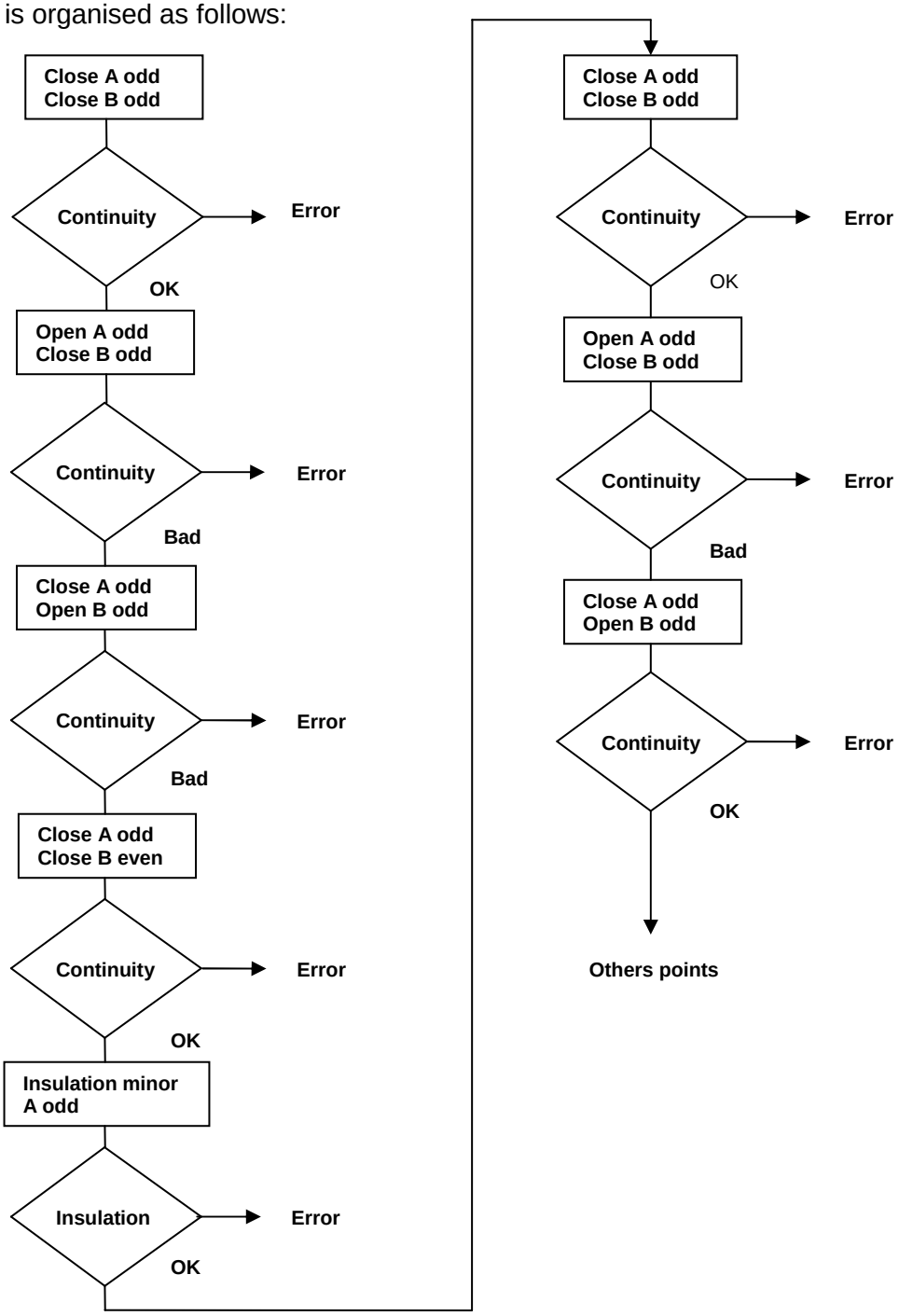
Under the best conditions (test voltage 2000 V and low humidity) it is possible to test to 2000 MΩ but the self test can be requested at 3000 MΩ in order to ensure that the tester will not be included in the measurement.

As a general rule, the 2000 V modules will always have better impedance than the 500 V ones, because the quality of the relays and the distance between the tracks enable better performance.

B.III.5.5 Selftest of 4-wire interfaces (KELVIN)

An additional function is available for testers fitted with a "4-wire" interface (KELVIN method): the even and odd points continuity and isolation link test.

The selftest is organised as follows:



Note: This test cannot run the bus insulation test and "unitary relay" test on multiple relay testers. This selftest is possible by disconnecting points 1 to 4 and running a normal selftest on these 4 points.

The request is made by selecting 4-WIRE INTERFACE on the CONFIGURATION tab of the selftest.

B.IV Using the TESTER

B.IV.1 BRIEF GLOSSARY

Below we list a few words with their definitions in order to make the instruction manuals as clear as possible.

CHAIN: another term for a net.

CONTINUITY: function yielding the result good if the resistance measured lies within the range of thresholds programmed. Low impedance function.

FILES: set of instructions needed by the tester to explorer a wiring system and determine its defects.

INSULATION: function designating as good a measurement greater than the threshold value programmed. High impedance function.

LIST OF POINTS: can be considered as a net, but may also group together points possessing the same characteristics (all insulated, all tested at very high voltage, etc.)

NET: Sequence of points in a wiring system having the same potential, and therefore connected by a wire (also known as a chain or tree). An isolated point constitutes a net of 1 point as far as the tester is concerned.

SELF LEARNING OR SPONTANEOUS LEARNING: a function whereby a test program can be created automatically from a calibration wiring system.

SWITCHING MATRIX: control system operating through relays (or semi-conductors) with which the points to be tested in the wiring system are selected.

TRANSCODING: software with which the tester translates "machine address" points into user points (including the names of the connectors and their pins).

B.IV.2 MENUS

(for further details, see "Instructions for use" and WINDOWS® on-line help)

The tester's software uses the WINDOWS® environment, with its dialogue boxes, buttons and scroll boxes. We shall not go any further into these concepts in the remainder of this document.

B.IV.3 ERROR MESSAGES

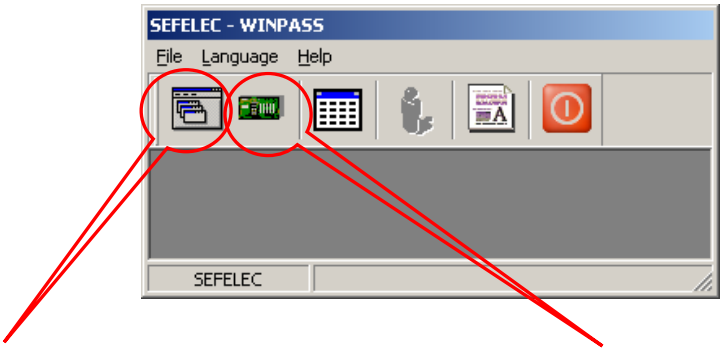
- Major defects detected by the system are displayed in clear on the screen.
- They show the problems encountered in the electronic operation of the tester**:**
- defective measurement;
- no printer available;
- disk unit absent or faulty;
- fault in the connection between the PC and the tester;
- etc.

Most of these messages inhibit operation of the tester as a precautionary measure (risk of misinterpretation of the test).

B.IV.4 THE TWO MODES

The WINDOWS® desktop contains the following icon:

Open it, then you have access to the two mode



EDITOR **TESTER**

The TESTER requires connection of the PC to the tester. It gives access to all the test functions: "test", "self learning" and "self test".

The EDITOR is completely independent of the tester and can be used when the tester is disconnected or not switched on. It is used for all operations on the test programmes, from creation to modification.

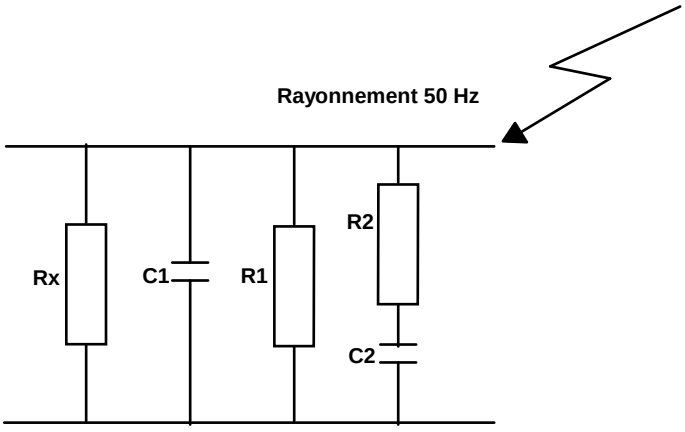
Note: *Both these functions can have password control*

B.V Parameters affecting the accuracy of measurements of insulation

B.V.1 GENERAL

Measurements of insulation carried out on the tester are affected by the noise structure of the switching matrix, the interface and the wiring to be tested, which explains the compromise that has to be reached between speed and accuracy.

The wiring to be tested brought into communication by the switching matrix with terminals of the measurement apparatus, possesses the following structure:



where Rx is the resistance to be measured.

C1,R1 and C2,R2 are made up of the noise elements inherent in the wiring and the switching matrix.

B.V.2 INFLUENCES AND SOLUTIONS ADOPTED TO INHIBIT THE EFFECT OF THE NOISE ELEMENTS

B.V.2.1 Effect of the capacitance c1

The capacitance C1 is due to the interlink capacitances in the tester, the interface and the wire to be tested.

Its value is relatively high, about 4 to 5 nF, but it is easy, using the low impedance of the source of the measurement circuits, to charge and discharge it quickly. Its effects on the measurement cycle are negligible.

B.V.2.2 Effect of the resistance r1

This resistance, which is very high in value, makes practically no difference to the measurement. However, at high humidity levels, this value can fall, until it forms, in parallel with Rx, a by no means negligible element which can disrupt the measurement.

In this case, as the equivalent resistance is weaker, the solution is to lower the rejection parameters, so that the test can be conducted under identical conditions.

B.V.2.3 Effect of the series network r2,c2

This serial RC network, made up of the total of stray capacitances of the open relay contacts and leakage resistances, exerts a considerable influence as a function of the speed of the tester. It introduces a parallel element of impedance that varies as a function of time at the terminals of Rx all the time that C2 is charging.

The deterioration in accuracy of measurement at high speeds is due to this phenomenon.

B.V.2.4 Effect of 50 Hz radiation

The assembly to be tested is bathed in 50 Hz radiation, which can be significant and can affect the measurement.

This is because the lower the test voltage, the lower the signal to noise ratio, and the more the influence of this radiation will perturb measurement. These effects are warded off by synchronization and integration of the signal for one or more cycles of the supply.

B.V.3 CONCLUSION

These phenomena taken together, and the solutions adopted to remedy their effects, lead to the following conclusions:

The accuracy of the measurements obtained is a function of the time and voltage of measurement:

- the longer the time, the greater the accuracy of measurement.
- the higher the voltage, the greater the accuracy of measurement.

After insulation and continuity test, the tester SYNOR 4200 complete a 20 ms discharge of the measuring points. For tests with high capacitive components this time of discharge might be adjusted. Please contact our technical department to fit this time

T (in s) = RC for a total discharge, time of discharge >5T

R discharge = 1 kΩ

B.VI IMPORTANCE of the measurement of line RESISTANCE

B.VI.1 FUNCTIONAL TOLERANCE

Wiring charts do not generally include any tolerances regarding the line resistance of electrical links.

At the moment, the values given on this subject by most test instructions do not seem to constitute a functional value beyond which a malfunction is present by definition.

B.VI.2 TYPICAL VALUES

If an electrical connection is made a large number of times, it can be observed that the resistance of this link is almost always centred around a mean value known as the "typical value".

The degree of scatter around this value is a matter of only a few per cent (tolerance on lengths, cross-sections, etc.).

B.VI.3 DEVIATION

If we suppose that an electrical link has a typical resistance of 100 mΩ and that the functional tolerance is 500 mΩ, we shall normally find values such as 95, 100, 105, 90, 110 mΩ.

If a test is performed and yields a measurement of 200 mΩ, the presence of an anomaly must be deduced.

There may be two reasons for this value:

- a stable non-conformity (error of cross-section, etc.)
- an unstable non-conformity (bad contact, etc.)

In the first case, the wire can be accepted if its cross-section is greater than the value demanded.

In the second case, it is known that a bad contact can evolve into a complete break. This deterioration increases with time and as a function of environmental conditions. It often takes the form of oxidation of the contact surface.

If we accept, in our example, that the resistance has doubled between two tests, it is likely that the same law will continue to hold over time.

Thus, the value of 200 mΩ, although lower than the functional value, is indicative of a fault which, with time, will lead to a breakdown of the equipment.

B.VI.4 CONCLUSION

AERO 543-35 standards specify a tolerance threshold of 30%.

The **SYNOR 4200** tester can carry out 4 wires (Kelvin methode) measurements starting at 1 mΩ, which enables it to carry out measurements of this type on wires of 50 cm length and 5/10 mm cross-section (between 7 and 13 mΩ) with good resolution.

B.VII USEFUL INFORMATION

B.VII.1 INTERFACE FOR SYNOR 4202

The measuring channels of the SYNOR 4200 are available on 64-pin connectors of the 41612 series (HE 10). The switching cards can be mixed between 500 V and 2000 V.

Each switching card has two output connectors (see photo) arranged vertically. The 500 V cards have two times 64 output channels and the 2000 V cards two times 32 (see diagram).

B.VII.1.1 Characteristics of connectors on the interface side

a – 500 V outputs: male connectors, type 41612, 64-pin, R.(a+c), class 1

- SOURIAU reference: 8609 464 78 09 755 000 E1 (solder eyelets)
  8609 464 78 14 755 000 E1 (wrapping pins)
- HARTING reference: 09 73 164 6907 (wrapping pins)
  09 73 164 6903 (straight pins for printed circuit)
- 3M reference: 3695 0000 (self-stripping)
- HARTING hood 09 03 096 0501 with M2.5 x 30 screw
- HARTING grommet 09 02 000 99 11

On 40417 C cards, the screws are replaced by two locking levers:

Right locking 09 02 000 99 03

Left locking 09 02 000 99 02

Warning: *Connectors with solder eyelets have very long delivery times. We recommend wrapping pins provided a few wiring precautions are taken.*

Note: Self-stripping connectors can be used but with a heat-bonded (not extruded) flat cable, pitch 1.27 mm, 64-wire, AWG 28.

- Thomas&Betts reference: 201-64-100
- Tyco/AMP reference: 6-57643-4

In this case, remember that the points are wired in column arrangement and not "zigzag".

b – 2000 V outputs: male connectors, type 41612, 64-pin, R.(a+c) body, class 1, only even pins are mounted, i.e. 32 pins.

- SOURIAU reference: 8609 432 78 09 755 000 E1 (solder eyelets)
- HARTING reference: 09 73 132 6907 (wrapping pins)
- HARTING hood 09 03 096 0501 with M2.5 x 30 screw
- HARTING grommet 09 02 000 99 11

On 40418 C cards, the screws are replaced by two locking levers:

Right locking 09 02 000 99 03

Left locking 09 02 000 99 02

Warning: *Connectors with solder eyelets have very long delivery times. We recommend wrapping pins provided a few wiring precautions are taken.*

The voltages used are too high for flat cables.

B.VII.1.2 Some advice for implementing the interfaces

For easier writing of the correspondence table between tester points and user points (connectors and pins of the wiring to be tested), it is important to connect the connectors in the same order as the tester addresses.

As electrical wire resistance is negligible compared with contact resistance, there is no reason not to create connection jumpers long enough to allow easy access to the equipment being tested (handling for repair without disconnecting).

Jumper technology must be chosen so that the whole is as flexible as possible. “Rilsan” jackets are a good solution but should not be tightened too much or have strands with too many wires (64 is the correct maximum).

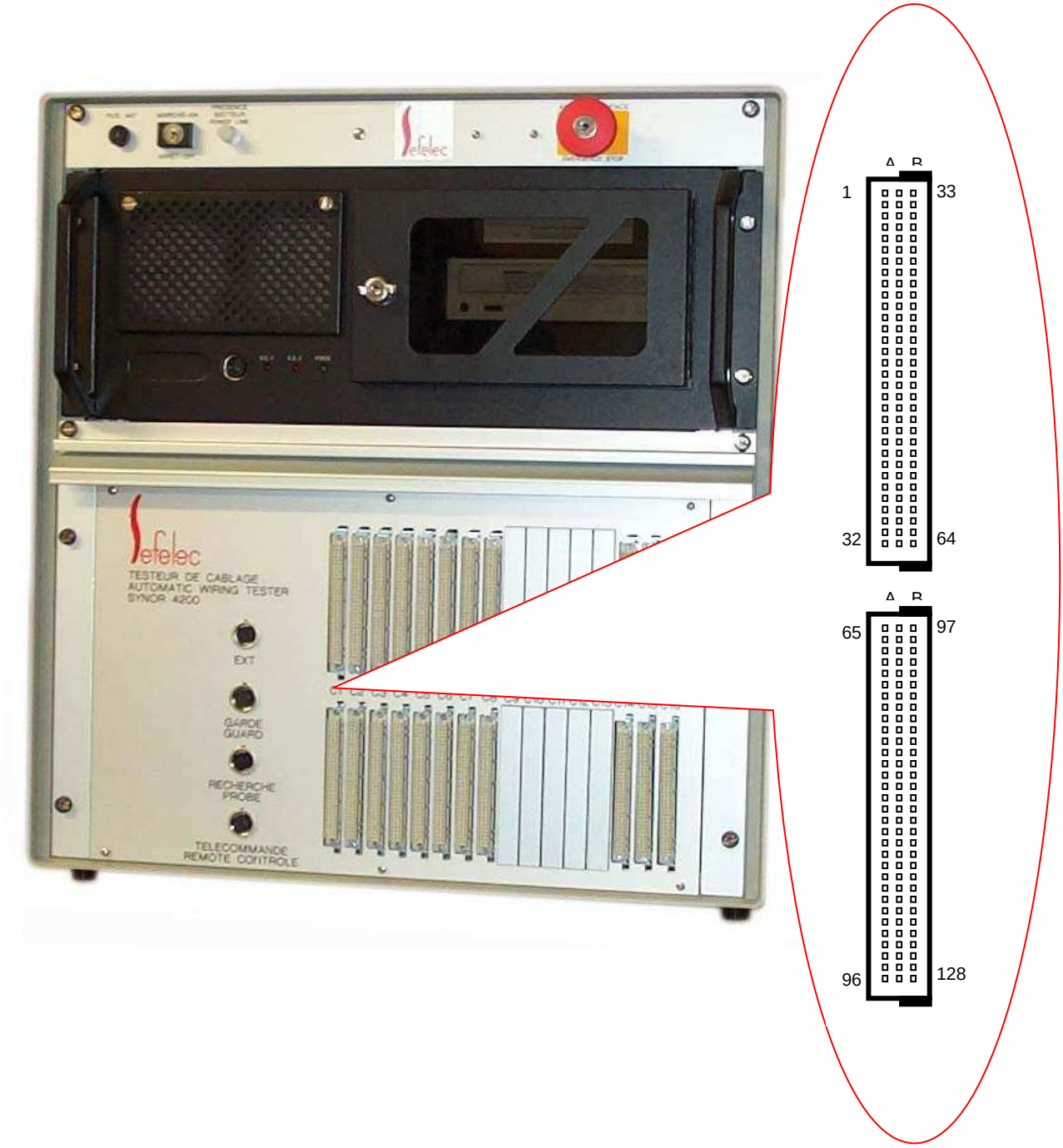
To make connections easier, the tester addresses may be left free, if the number of tester points makes this possible. For example, if you have a tester for a 64-pin connector that you are going to use to test a 50-pin connector, 14 addresses can be left free if the tester cannot be completed with a smaller connector.

All of the pins of a connector on the equipment to be tested must be connected to the tester without fail. Otherwise, the tester risks not seeing certain defects or poorly interpreting an inversion. However, free addresses on a tester can be left unprogrammed (saves time during the test).

The voltages used by measurements routed by these cards must be insulated properly (jacket, spacing, cleaning, etc.), the conductor sections will only be dependent on continuity measurements.

B.VII.1.3 View of tester outputs

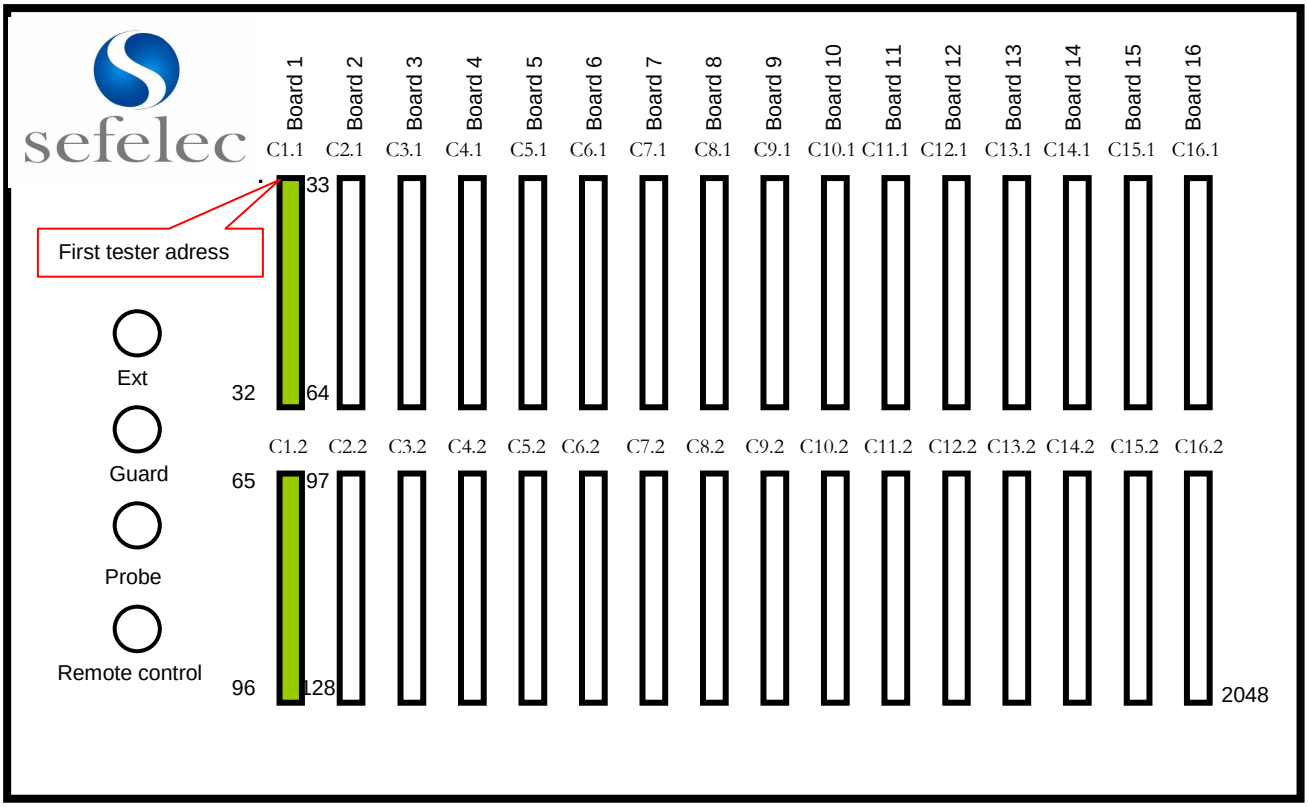
The connector described in this document is the tester connector. For reasons of electrical safety, it is a female connector.



B.VII.2 SWITCHING CARDS 40417 AND 40427

Switching cards 40417 (500 Vdc / 380 Vac – 2 A - 128 points) or 40427 (1000 Vdc / 750 Vac – 2 A - 128 points) route the measurement of SYNOR 1202, 4202 and 4203 testers. They are placed in racks receiving a maximum of 16 cards each (2 for the SYNOR 1202). They are all identical, only their position determines their address. They are intermixable with cards 40418 and 40428 (see the technical datasheet). Since the relays used are multi-contact, these cards may be used for all tests except tests by groups of points.

One card uses two vertical connectors, standard 41612 (green on the diagram on the front of the tester). Columns A and C are used. The tester addresses are shown on the diagram.



HARTING reference of interface connectors:

09 73 164 6907	Male connector
09 03 096 0501	Hood
09 02 000 9911	Grommet
09 02 000 9902	Left locking
09 02 000 9903	Right locking

Wires recommended for wiring: TYCO-RAYCHEM 44A0111-24-n (n colour code) or choose an insulating material, as flexible as possible, corresponding to the measurement voltage and a 22 to 24 gauge.

Note: Self-stripping connectors can be used but with a heat-bonded (not extruded) flat cable, pitch 1.27 mm, 64-wire, AWG 28 gauge.

Thomas&Betts reference: 201-64-100

Tyco/AMP reference: 6-57643-4

In this case, remember that the points are wired in column arrangement and not "zigzag". Because the hoods cannot be used, the locking parts must be dismantled on the switching cards.

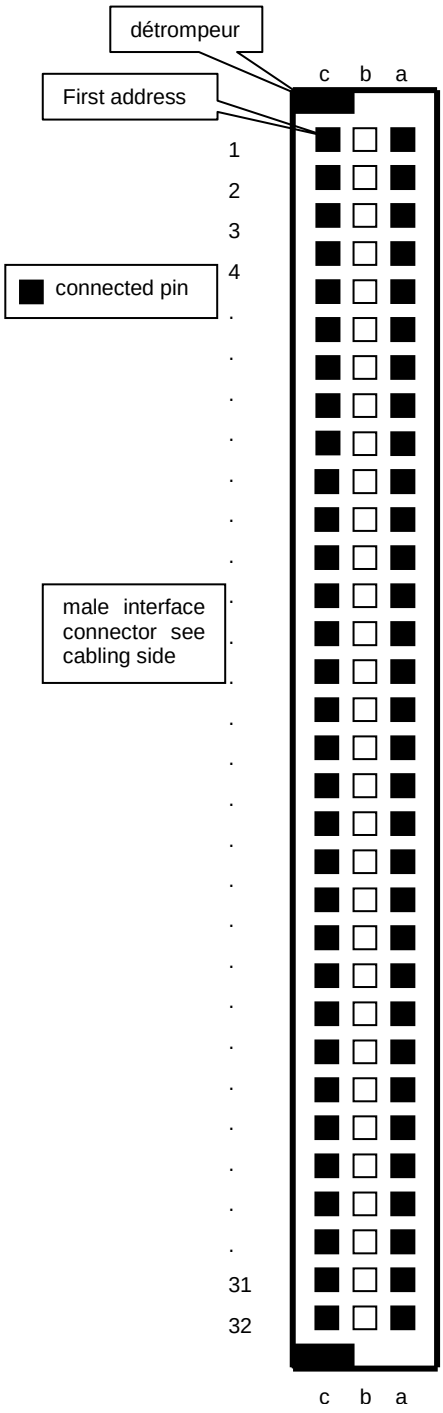
The most available connectors on the market are wrapping ones. Each weld will be protected by the heat-shrinkable cover. It is advised to remove the marking ink between the connector pins (risk of poor isolation).

The connector of the right figure is the male interface connector, seen from the wiring side.

Row “b” is never used. All the other pins are wired (see wiring list below).

This list gives the wiring of the first connector of the first switching card. The other connectors are organised in the same way.

Tester address	male interface connector	Customer connector
1	c1	< >
2	c2	< >
3	c3	< >
4	c4	< >
5	c5	< >
6	c6	< >
7	c7	< >
8	c8	< >
9	c9	< >
10	c10	< >
11	c11	< >
12	c12	< >
13	c13	< >
14	c14	< >
15	c15	< >
16	c16	< >
17	c17	< >
18	c18	< >
19	c19	< >
20	c20	< >
21	c21	< >
22	c22	< >
23	c23	< >
24	c24	< >
25	c25	< >
26	c26	< >
27	c27	< >
28	c28	< >
29	c29	< >
30	c30	< >



31	c31	< >
32	c32	< >
33	a1	< >
34	a2	< >
35	a3	< >
36	a4	< >
37	a5	< >
38	a6	< >
39	a7	< >
40	a8	< >
41	a9	< >
42	a10	< >
43	a11	< >
44	a12	< >
45	a13	< >
46	a14	< >
47	a15	< >
48	a16	< >
49	a17	< >
50	a18	< >
51	a19	< >
52	a20	< >
53	a21	< >
54	a22	< >
55	a23	< >
56	a24	< >
57	a25	< >
58	a26	< >
59	a27	< >
60	a28	< >
61	a29	< >
62	a30	< >
63	a31	< >
64	a32	< >

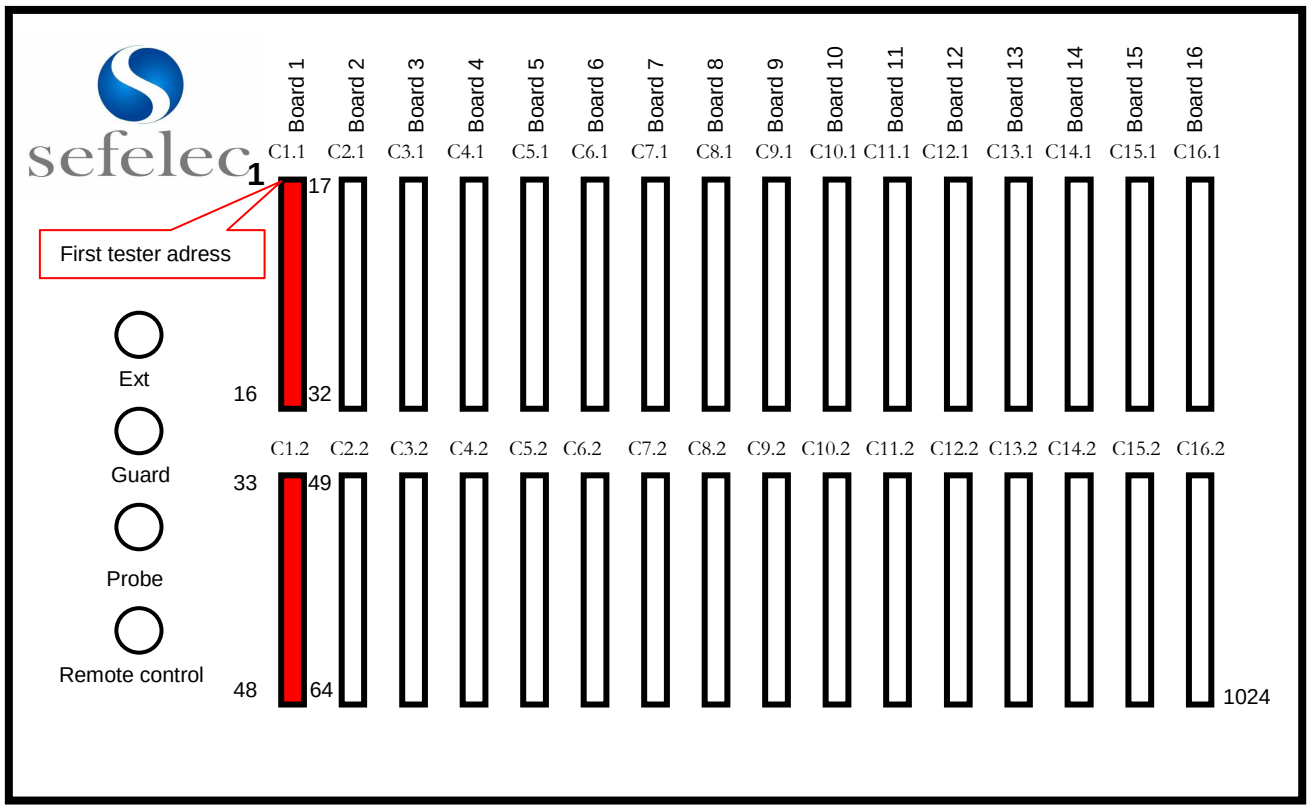
B.VII.3 SWITCHING CARDS 40418 AND 40428

Switching cards 40418 or 40428 (2000 Vdc / 1500 Vac – 2 A - 64 points) route the measurement of the SYNOR 1202, 4202 and 4203 testers (2 for the SYNOR 1202).

They are placed in racks receiving a maximum of 16 cards each.

They are all identical, only their position determines their address. They are intermixable with cards 40417 and 40427 (see the technical datasheet). Since the relays used are multi-contact, these cards may be used for all tests except tests by groups of points.

One card uses two vertical connectors, standard 41612 (red on the diagram on the front of the tester). Columns A and C are used. The tester addresses are shown on the diagram.



HARTING reference of interface connectors:

09 73 164 6907	Male connector
09 03 096 0501	Hood
09 02 000 9911	Grommet
09 02 000 9902	Left locking
09 02 000 9903	Right locking

Wires recommended for wiring: TYCO-RAYCHEM 44A0111-24-n (n colour code) or choose an insulating material, as flexible as possible, corresponding to the measurement voltage and a 22 to 24 gauge.

Note: *it is not possible to use self-stripping connectors at these voltages.*

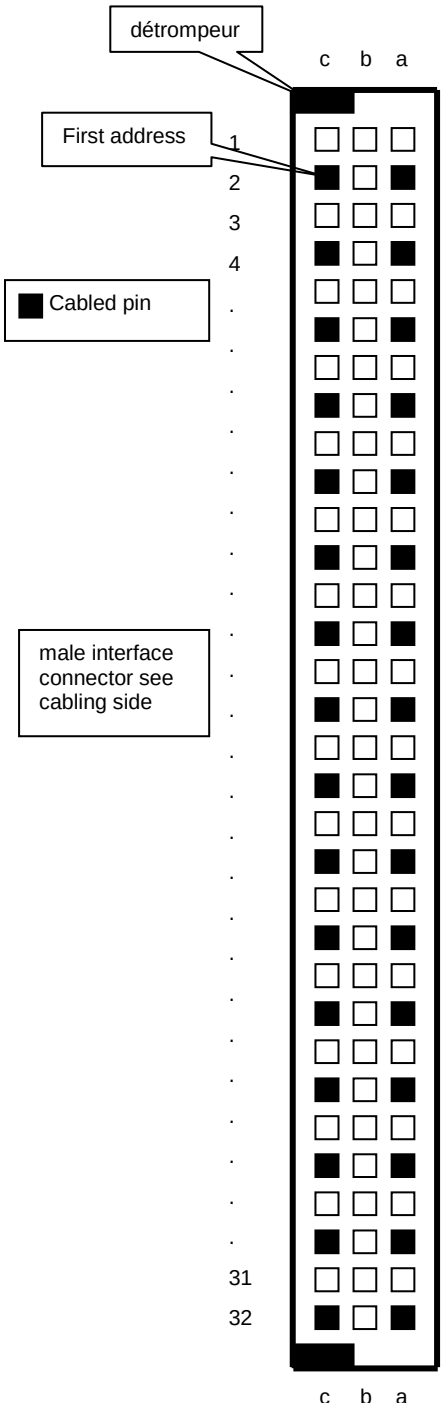
The most available connectors on the market are wrapping ones. Each weld will be protected by the heat-shrinkable cover. It is advised to remove the marking ink between the connector pins (risk of poor isolation).

The connector of the right figure is the male interface connector, seen from the wiring side.

Row “b” is never used. For all the other pins, one in every two is wired (see wiring list below).

This list gives the wiring of the first connector of the first switching card. The other connectors are organised in the same way.

Tester address	male interface connector	Customer connector
	c1	
1	c2	< >
	c3	
2	c4	< >
	c5	
3	c6	< >
	c7	
4	c8	< >
	c9	
5	c10	< >
	c11	
6	c12	< >
	c13	
7	c14	< >
	c15	
8	c16	< >
	c17	
9	c18	< >
	c19	
10	c20	< >
	c21	
11	c22	< >
	c23	
12	c24	< >
	c25	
13	c26	< >
	c27	
14	c28	< >
	c29	
15	c30	< >
	c31	
16	c32	< >
	a1	
17	a2	< >
	a3	
18	a4	< >
	a5	
19	a6	< >
	a7	

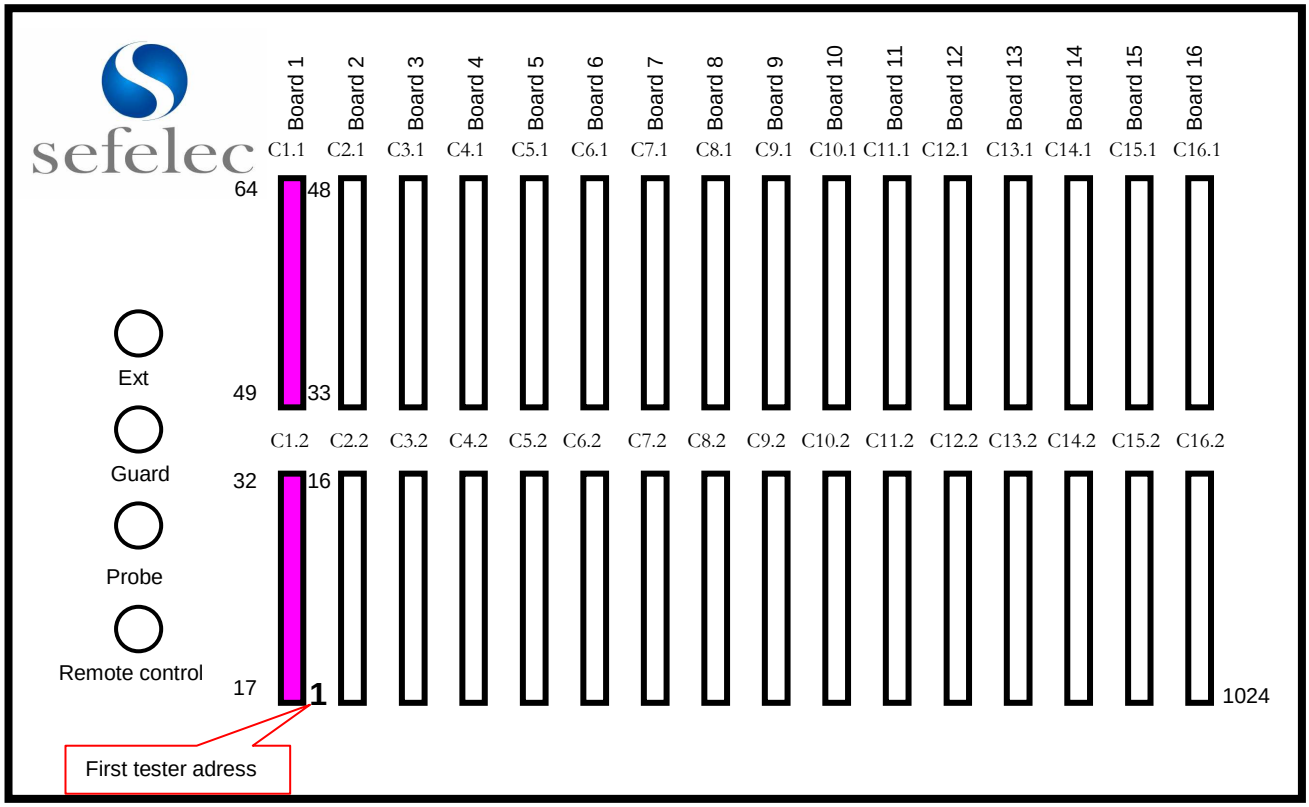


20	a8	< >
	a9	
21	a10	< >
	a11	
22	a12	< >
	a13	
23	a14	< >
	a15	
24	a16	< >
	a17	
25	a18	< >
	a19	
26	a20	< >
	a21	
27	a22	< >
	a23	
28	a24	< >
	a25	
29	a26	< >
	a27	
30	a28	< >
	a29	
31	a30	< >
	a31	
32	a32	< >

B.VII.4 SWITCHING CARDS 40570 AND 40670

Switching cards 40570 or 40670 (2000 Vdc / 1500 Vac – 2 A - 64 points) route the measurement of the SYNOR 4207 and 4208. They are placed in racks receiving a maximum of 16 cards each. They are all identical, only their position determines their address. They are intermixable with 40675 cards (see the technical datasheet). Since the relays used are mono-contact, these cards may be used for all tests including tests by groups of points.

One card uses two vertical connectors, standard 41612 (purple on the diagram on the front of the tester). Columns A and C are used. The tester addresses are shown on the diagram.



HARTING reference of interface connectors:

09 73 164 6907	Male connector
09 03 096 0501	Hood
09 02 000 9911	Grommet
09 02 000 9902	Left locking
09 02 000 9903	Right locking

Wires recommended for wiring: TYCO-RAYCHEM 44A0111-24-n (n colour code) or choose an insulating material, as flexible as possible, corresponding to the measurement voltage and a 22 to 24 gauge.

Note: *it is not possible to use self-stripping connectors at these voltages.*

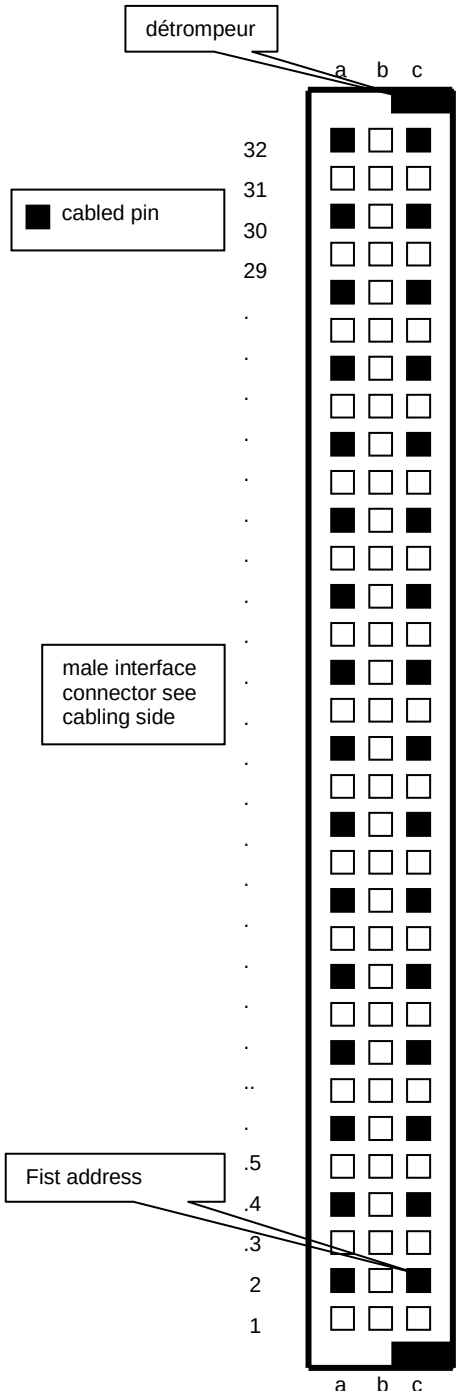
The most available connectors on the market are wrapping ones. Each weld will be protected by the heat-shrinkable cover. It is advised to remove the marking ink between the connector pins (risk of poor isolation).

The connector of the right figure is the male interface connector, seen from the wiring side.

Row “b” is never used. For all the other pins, one in every two is wired (see wiring list below).

This list gives the wiring of the first connector of the first switching card. The other connectors are organised in the same way.

Tester address	male interface connector	Customer connector
	c1	
1	c2	< >
	c3	
2	c4	< >
	c5	
3	c6	< >
	c7	
4	c8	< >
	c9	
5	c10	< >
	c11	
6	c12	< >
	c13	
7	c14	< >
	c15	
8	c16	< >
	c17	
9	c18	< >
	c19	
10	c20	< >
	c21	
11	c22	< >
	c23	
12	c24	< >
	c25	
13	c26	< >
	c27	
14	c28	< >
	c29	
15	c30	< >
	c31	
16	c32	< >
	a1	
17	a2	< >
	a3	
18	a4	< >
	a5	
19	a6	< >
	a7	
20	a8	< >

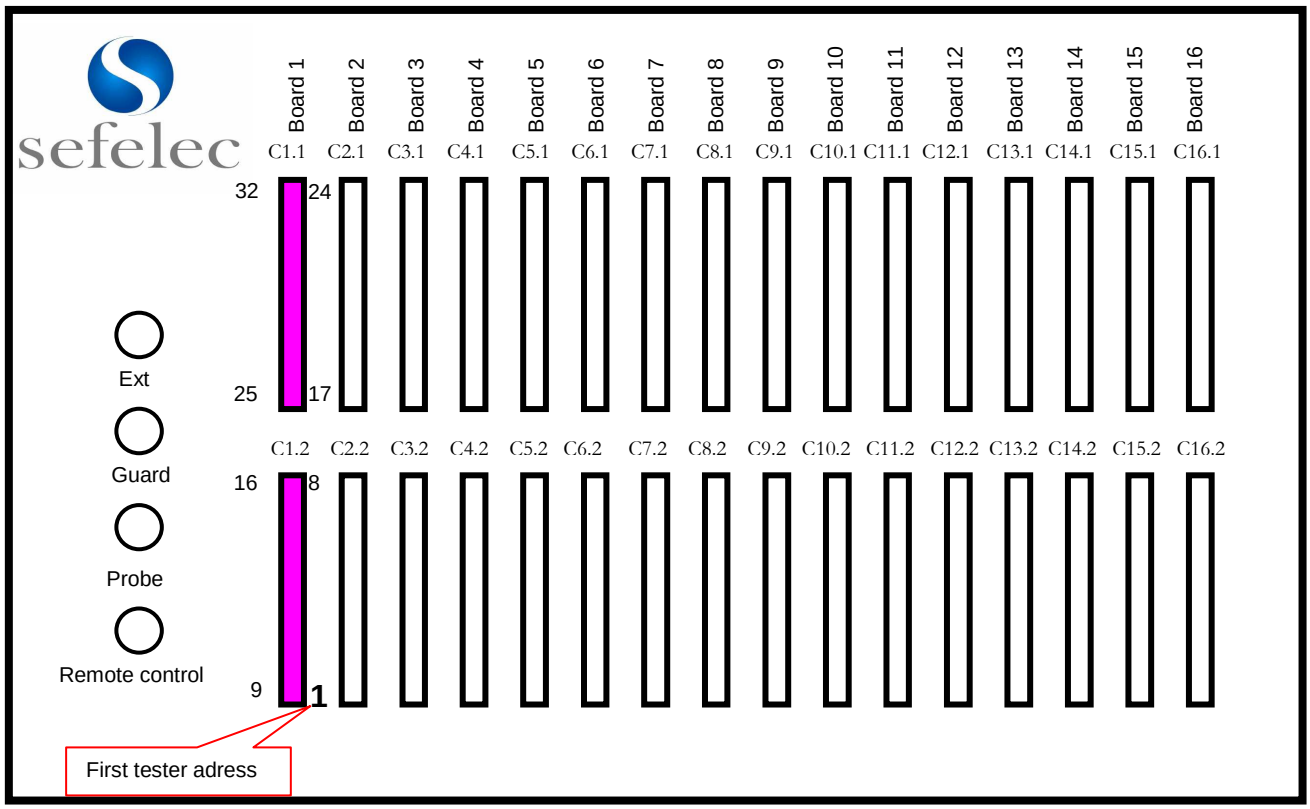


	a9	
21	a10	< >
	a11	
22	a12	< >
	a13	
23	a14	< >
	a15	
24	a16	< >
	a17	
25	a18	< >
	a19	
26	a20	< >
	a21	
27	a22	< >
	a23	
28	a24	< >
	a25	
29	a26	< >
	a27	
30	a28	< >
	a29	
31	a30	< >
	a31	
32	a32	< >

B.VII.5 SWITCHING CARDS 40675

Switching cards 40675 (3000 Vdc / 2000 Vac – 2 A - 32 points) route the measurement of the SYNOR 4207 and 4208. They are placed in racks receiving a maximum of 16 cards each. They are all identical, only their position determines their address. They are intermixable with 40670 cards (see the technical datasheet). Since the relays used are mono-contact, these cards may be used for all tests including tests by groups of points.

One card uses two vertical connectors, standard 41612 (orange on the diagram on the front of the tester). Columns A and C are used. The tester addresses are shown on the diagram.



HARTING reference of interface connectors:

09 73 164 6907	Male connector
09 03 096 0501	Hood
09 02 000 9911	Grommet
09 02 000 9902	Left locking
09 02 000 9903	Right locking

Wires recommended for wiring: TYCO-RAYCHEM 44A0111-24-n (n colour code) or choose an insulating material, as flexible as possible, corresponding to the measurement voltage and a 22 to 24 gauge.

Note: *it is not possible to use self-stripping connectors at these voltages.*

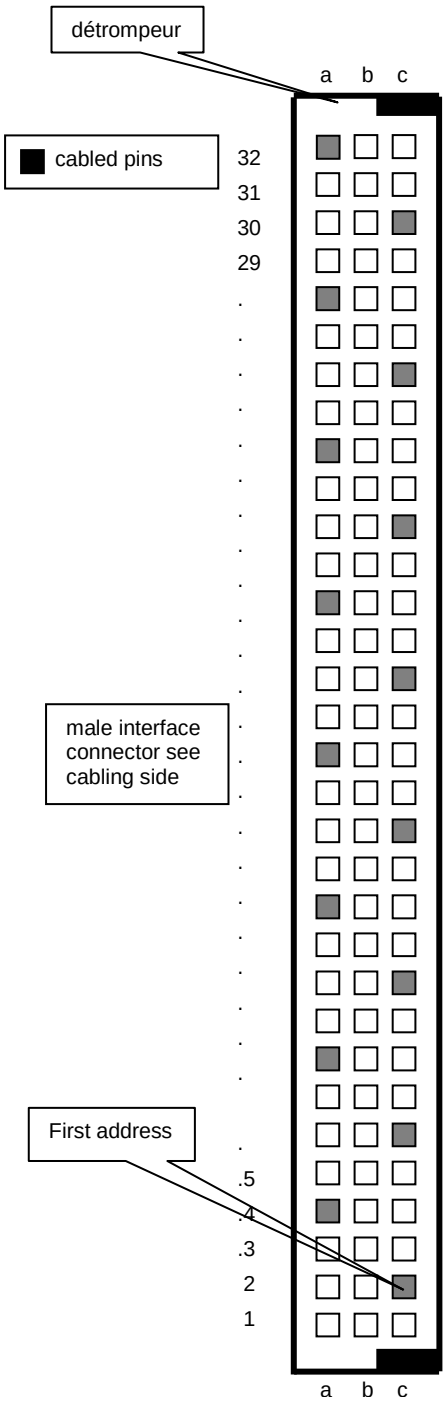
The most available connectors on the market are wrapping ones. Each weld will be protected by the heat-shrinkable cover. It is advised to remove the marking ink between the connector pins (risk of poor isolation).

The connector of the right figure is the male interface connector, seen from the wiring side.

Row “b” is never used. For all the other pins, one in every four is wired (see wiring list below).

This list gives the wiring of the first connector of the first switching card. The other connectors are organised in the same way.

Tester address	male interface connector	Customer connector
	c1	
1	c2	< >
	c3	
	c4	< >
	c5	
2	c6	< >
	c7	
	c8	< >
	c9	
3	c10	< >
	c11	
	c12	< >
	c13	
4	c14	< >
	c15	
	c16	< >
	c17	
5	c18	< >
	c19	
	c20	< >
	c21	
6	c22	< >
	c23	
	c24	< >
	c25	
7	c26	< >
	c27	
	c28	< >
	c29	
8	c30	< >
	c31	
	c32	< >
	a1	
	a2	< >
	a3	
9	a4	< >
	a5	
	a6	< >
	a7	

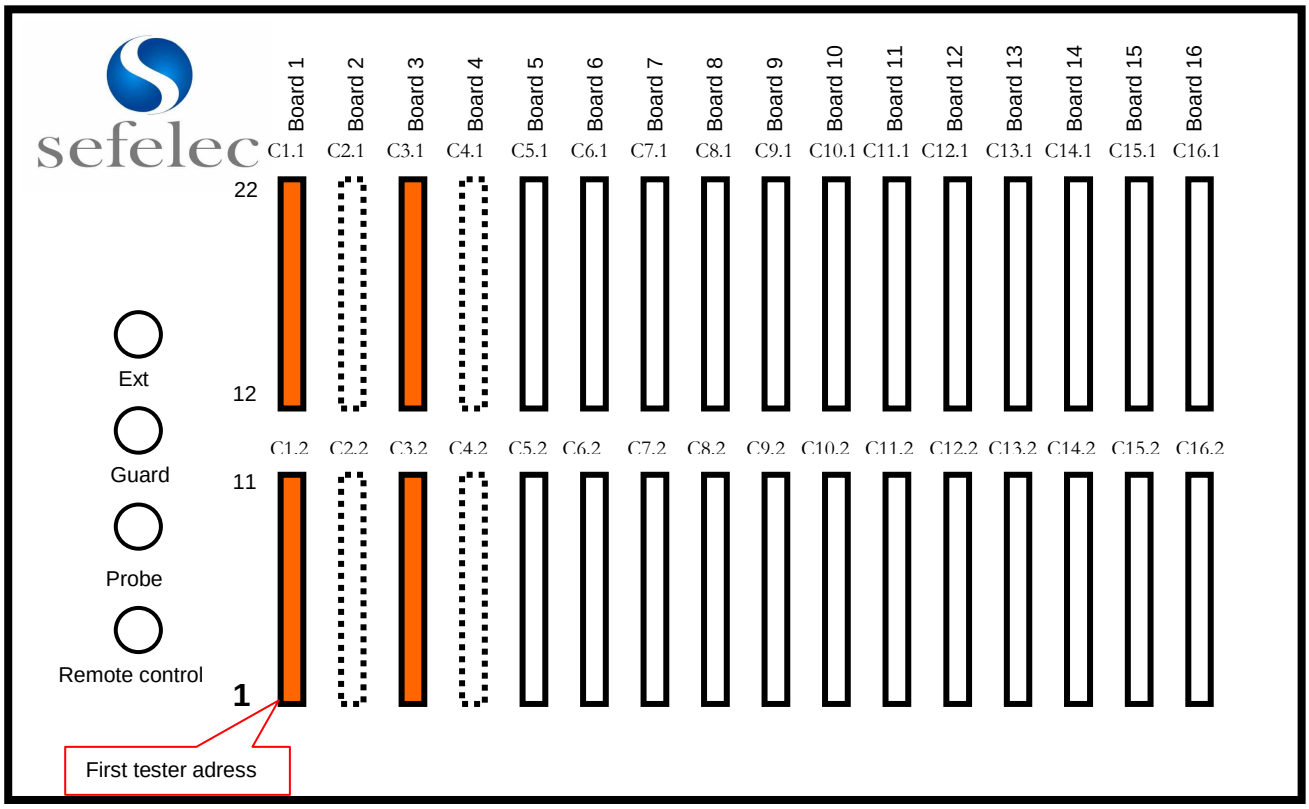


10	a8	< >
	a9	
	a10	< >
	a11	
11	a12	< >
	a13	
	a14	< >
	a15	
12	a16	< >
	a17	
	a18	< >
	a19	
13	a20	< >
	a21	
	a22	< >
	a23	
14	a24	< >
	a25	
	a26	< >
	a27	
15	a28	< >
	a29	
	a30	< >
	a31	
16	a32	< >

B.VII.6 SWITCHING CARDS 40680

Switching cards 40680 (2000 Vdc / 1500 Vac – 10 A - 22 points) route the measurement of the SYNOR 4207 and 4208. They are placed in racks receiving a maximum of 8 cards each (2 slots are occupied by these cards). They are all identical, only their position determines their address. They are intermixable with cards 40570, 40670 and 40675. Because the relays used are mono-contact, these cards may be used for all tests including tests by groups of points.

One card uses two vertical connectors, standard 41612 (orange on the diagram on the front of the tester). Columns A and C are used. The tester addresses are shown on the diagram. Each card occupies 2 slots, so there are only 8 cards per unit.



HARTING reference of interface connectors:

09 73 164 6907	Male connector
09 03 096 0501	Hood
09 02 000 9911	Grommet
09 02 000 9902	Left locking
09 02 000 9903	Right locking

Because these cards are intended to route currents up to 10 A, the sections must be chosen on the basis of these currents.

Note: *it is not possible to use self-stripping connectors at these voltages and currents.*

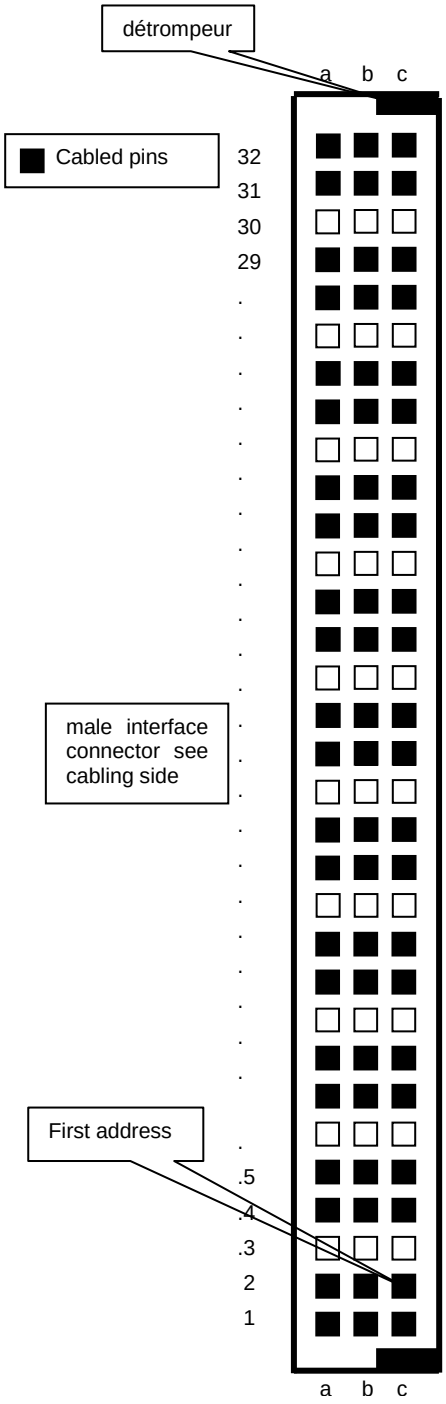
The most available connectors on the market are wrapping ones. Each weld will be protected by the heat-shrinkable cover. It is advised to remove the marking ink between the connector pins (risk of poor isolation).

The connector of the right figure is the male interface connector, seen from the wiring side.

Row “b” is never used. For all the other pins, one in every four is wired (see wiring list below).

This list gives the wiring of the first connector of the first switching card. The other connectors are organised in the same way.

Tester adress	male interface connector	Customer connector
1	a1/b1/c1	
1	a2/b2/c2	< >
	a3/b3/c3	
2	a4/b4/c4	< >
2	a5/b5/c5	
	a6/b6/c6	< >
3	a7/b7/c7	
3	a8/b8/c8	< >
	a9/b9/c9	
4	a10/b10/c10	< >
4	a11/b11/c11	
	a12/b12/c12	< >
5	a13/b13/c13	
5	a14/b14/c14	< >
	a15/b15/c15	
6	a16/b16/c16	< >
6	a17/b17/c17	
	a18/b18/c18	< >
7	a19/b19/c19	
7	a20/b20/c20	< >
	a21/b21/c21	
8	a22/b22/c22	< >
8	a23/b23/c23	
	a24/b24/c24	< >
9	a25/b25/c25	
9	a26/b26/c26	< >
	a27/b27/c27	
10	a28/b28/c28	< >
10	a29/b29/c29	
	a30/b30/c30	< >
11	a31/b31/c31	
11	a32/b32/c32	< >



B.VII.7 LIMITS OF INSULATION TEST UNDER NORMAL MEASUREMENT CONDITIONS

	300 MΩ	1500 MΩ	2000 MΩ	3000 MΩ
2000 V				
1000 V				
500 V				
100 V				

B.VII.8 LIMITS OF CONTINUITY TEST UNDER NORMAL MEASUREMENT CONDITIONS

4 wires (Kelvin methode) test < 5%

2 wires test < 5%

	10 mA	100 mA	250 mA	500mA	1 A	2A
1 mΩ to 2 mΩ						
2 mΩ to 10 Ω						
10 mΩ to 100 mΩ						
100 mΩ to 1 Ω						
1 Ω to 250 Ω						

"4 wires (Kelvin methode) resistance" measurement is possible for resistors greater than 100 mΩ

B.VII.9 INTERFACE DURING 4 WIRES (KELVIN METHODE) MEASUREMENT OF RESISTANCE

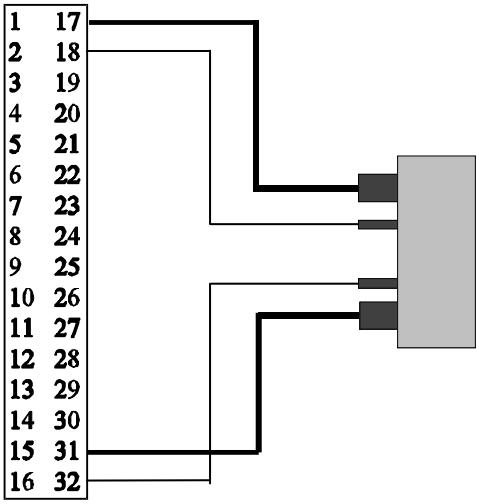
The syntax used for measurement of continuity in 4 wires (Kelvin methode) mode takes the form:

4 A [xx] B [yy]

The numbers xx and yy are the absolute tester points and must both be **odd**.

Example: 4 A [17] B [31]

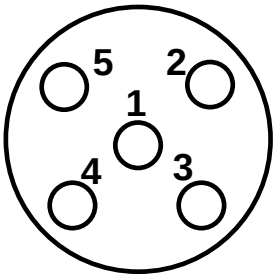
The interface between the tester and the resistance to be measured must then be arranged as follows:



Points 17 and 31 must be connected to the resistor power points (current injection); they are named by the syntax (see programming).

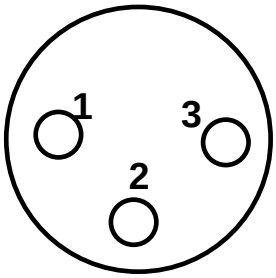
Points 18 and 32 are connected to the "sense" points (voltmeter) of the resistor to be measured, but are not named by the syntax.

B.VII.10 LAYOUT OF FRONT SOCKET



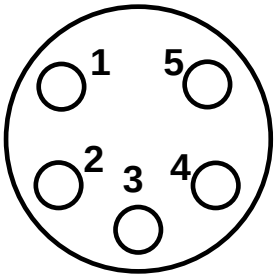
External output

1 - NC
2 - Measure A
3 - Sense B
4 - Measure B
5 - Sense A



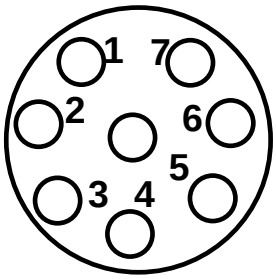
Warning light

1 – Green light
2 - Common
3 – Red light



Probe

3 - Probe



Remote switch

1 – Remote switch
2 – Safety loop 1A
3 – Safety loop 2A
4 – NC
5 – Safety loop 1B
6 - Safety loop 2B
7 - Remote switch

The points not mentioned are not connected.

Note: *The safety loop originally equips all testers as from October 2007.*

C. ANALYSIS OF THE TEST RESULTS

The following instructions are intended more especially for the user of the tester. Once the technician has set up the test programs, interfaces and connections, the user (checker or wirer) has to interpret the error list correctly in order to save precious time and improve the test operations.

Recommendations:

The operator should avoid cluttering his work space with unnecessary documents. The recommended documents are:

- the tool connection document,
- the wiring diagram,
- the (transcoded) error list provided by the tester.

C.I PRESENTATION OF THE ERROR LIST

For transcoded errors, the connector names are separated from the pins by a full stop, - or /, depending on the selection, all between round brackets:

A (J1.5)

In the non-transcoded version, the same point is written with square brackets:

A [344]

During transcoding only the point address is modified, the other texts and indications remain exactly the same.

Whenever there is a wiring error, a message appears on the screen, and, on request, on the printer, according to the criterion chosen in "configuration".

Errors appear in red, PASSED test results in blue (on a full display).

Error messages:

1 – If there is a continuity or "broken circuit" error:

Continuity measurement error A (J1.12) B (TB1.EARTH) R > 250 Ohms

2 – If there is a continuity error due to a poor contact:

Continuity measurement error A (P4.21) B (J32.a) R = 15 Ohms

3 – If there is an insulation error due to a short circuit in relation to the lower points:

Insulation measurement error A (P6.AA) B (J12.5) R = 1.20 Ohms

4 – If there is an insulation error due to low resistance in relation to the lower points:

Insulation measurement error A (FRAME.EARTH) B (J24.1) R = < 50k Ohms

5 – If there is an insulation point with a long net (limited search is requested):

Insulation measurement error A (J4.T) B (J1.25) R = 1.25 Ohms

B (J2.28)

B (J2.30)

B (J3.5)

B (J4.1)

LIMITED SEARCH

6 – If there is an insulation error between 2 points:

Insulation measurement error A (point.34) B (point.237) R = 60MΩ

7 – If there is a breakdown or dielectric error on a point in relation to a net:

Insulation measurement error A (PRISE.12) B (J4.37) U= xxV

B (J4.39)

or T= xxxms

The time is given if the breakdown occurs during the application time. The voltage is given if there is a breakdown during the rise time.

8 – If the insulation test voltage was not reached by the end of the rise time, the error is close to a short circuit:

Insulation measurement error A (J45.12) B (P12.1) U<Uprog

9 – If there is a error during a test between 2 points, for all options:

FLT xxxxx A (TB1.5V) B (TB1.0V) xx = nnnn

C.II STUDY OF STANDARD WIRING ERRORS

Using a few straightforward examples, we will examine all the types of error encountered.

For a thorough understanding of the test results, the operator must think like the tester. In other words:

- Always test the points in a chain in relation to the original point, i.e. first point, described.

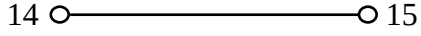
Example:

EI	B [5]	B [6]	B [12]	B [18]
	1st test	2nd test	3rd test	4th test
	Insulation with lower points	Continuity with 5	Continuity with 5	Continuity with 5

- if there is a break in a net and an EI test (multiple insulation) is requested at the start of the chain, this test is only valid for the second part of the chain. The tester therefore repeats an EI test on the 1st point of what it considers to be a second net (see example 8).

C.II.1 CONNECTION FORGOTTEN OR BROKEN WIRE

Correct wiring



Wiring produced

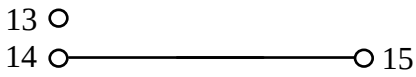
Test requested: EI B [14] B [15]

Test result: Continuity measurement error A[14] B[15]

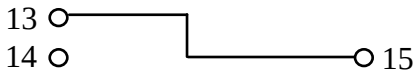
The insulation test of 14 in relation to all the other lower address points is passed. Only the break between 14 and 15 is reported by a continuity error message.

C.II.2 SINGLE CONNECTION WITH ONE INCORRECTLY CONNECTED TERMINATION WIRED TO AN ISOLATED LOWER-ADDRESS TERMINAL

Correct wiring:



Wiring produced:



Test requested:

EI B [13].

EI B [14] B [15].

Test result:

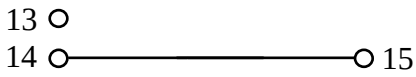
Continuity measurement error A[14] B[15]

Insulation measurement error A [15] B [13]

The insulation test of 14 in relation to the other lower address points is passed. The continuity test of point 14 in relation to point 15 is failed. The continuity error is therefore reported.

Point 15 becomes the generator and the insulation test of point 15 in relation to the lower address points is therefore failed as 15 is connected by mistake to 13. The faulty points and the insulation error are reported.

Correct wiring:



Wiring produced:

Test requested:

EI B [13].

EI B [14] B [15].

Test result:

Insulation measurement error A [14] B [13]

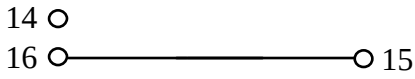
Continuity measurement error A[14] B [15]

The insulation test of 14 in relation to the other lower address points is failed (point 13). The continuity test between point 14 and point 15 is failed.

C.II.3 SINGLE CONNECTION WITH ONE INCORRECTLY CONNECTED TERMINATION WIRED TO AN ISOLATED HIGHER-ADDRESS TERMINAL

Correct wiring:

Wiring produced:



Test requested:

EI B [14] B [16].

EI B [15].

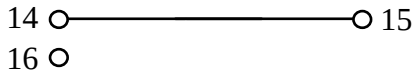
Test result:

Continuity measurement error A[14] B [16]

Insulation measurement error A [15] B [16]

The insulation test of 14 in relation to the other lower address points is passed. The continuity test of point 14 in relation to point 16 is failed. The type of error and the address of faulty points are listed. Finally, the insulation test of point 15 in relation to the lower address points is failed.

Correct wiring:



Wiring produced:

Test requested:

EI B [14] B [15].

EI B [16].

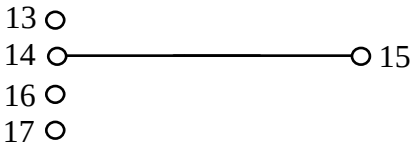
Test result:

Continuity measurement error A[14] B [15]

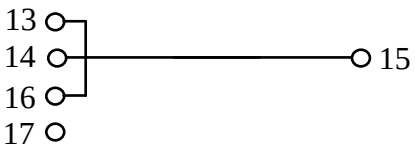
Insulation measurement error A [15] B [13]

C.II.4 ISOLATED POINT MISTAKENLY CONNECTED TO ANOTHER ISOLATED POINT

Correct wiring:



Wiring produced:



Test requested:

EI B [13].

EI B [14] B [15].

EI B [16].

EI B [17].

Test result:

Insulation measurement error A [13] B [13]

The insulation test of point 13 in relation to the lower address points is passed.

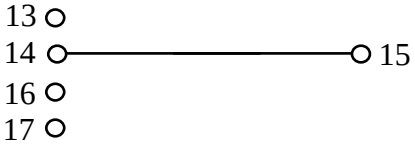
The insulation test of 14 in relation to the lower address points is passed.

The continuity test of point 14 in relation to point 15 is passed.

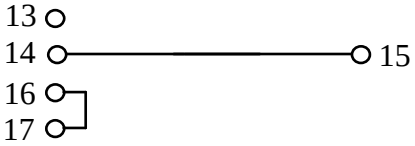
The insulation test of 16 in relation to the lower address points is failed.

The insulation test of 17 in relation to the lower address points is passed.

Correct wiring:



Wiring produced:



Test requested:

EI B [13].

EI B [14] B [15].

EI B [16].

EI B [17].

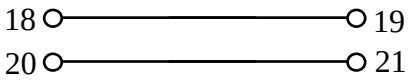
Test result:

Insulation measurement error A [17] B [16]

You are now familiar with the various basic error cases, so we will stop our analysis of the tester procedure here.

C.II.5 INVERSION OF TWO WIRES

Correct wiring:



Wiring produced:

Test requested:

EI B [18] B [19].

EI B [20] B [21].

Test result:

Continuity measurement error A [18] B [19]

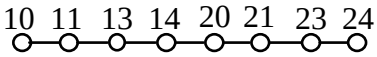
Insulation measurement error A [20] B [19]

Continuity measurement error A [20] B [21]

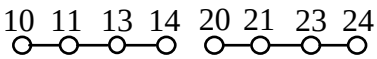
Insulation measurement error A [21] B [18]

C.II.6 BREAK IN A CONNECTION CHAIN

Correct wiring:



Wiring produced:



Test requested:

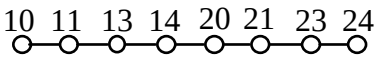
EI B [10] B [11] B [13] B [14] B [20] B [21] B [23] B [24] .

Test result:

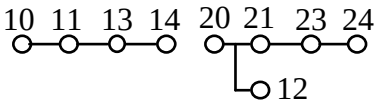
Continuity measurement error A [10] B [20]

C.II.7 BREAK IN A CONNECTION CHAIN WITH AN INCORRECT WIRE

Correct wiring:



Wiring produced:



Test requested:

EI B [10] B [11] B [13] B [14] B [20] B [21]B [23] B [24] .

EI B [12].

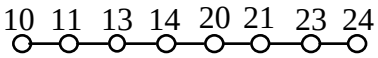
Test result:

Continuity measurement error A [10] B [20]

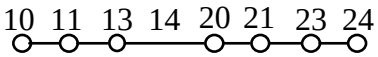
Insulation measurement error A [20] B [12]

C.II.8 UNCONNECTED WIRES IN A CHAIN

Correct wiring:



Wiring produced:



Test requested:

EI B [10] B [11] B [13] B [14] B [20] B [21]B [23] B [24] .

Test result:

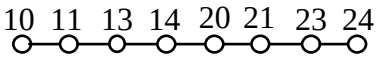
Continuity measurement error A [10] B [14]

Continuity measurement error A [14] B [20]

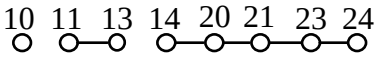
Insulation measurement error A [20] B [10] B [11] B [13]

When a continuity error is encountered in a connection chain, the test artificially divides the chain in two or more chains marked with an insulation test at the start.

Correct wiring:



Wiring produced:



Test requested:

EI B [10] B [11] B [13] B [14] B [20] B [21] B [23] B [24] .

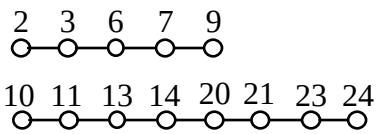
Test result:

Continuity measurement error A [10] B [11]

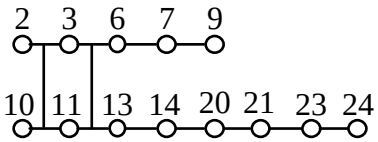
Continuity measurement error A [11] B [14]

C.II.9 TWO CHAINS CONNECTED TOGETHER

Correct wiring:



Wiring produced:



Test requested:

EI B [2] B [3] B [6] B [7] B [9] .

EI B [1O] B [11] B [13] B [14] B [20] B [21] B [23] B [24].

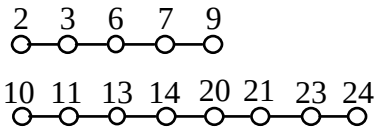
Test result:

Insulation measurement error A [10] B [2] B [3] B [6] B [7] B [9]

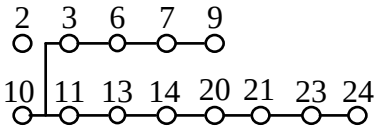
As the "jumper" puts both chains at the same potential, it is impossible for the tester to indicate the exact position of the jumper(s).

C.II.10 TWO CHAINS CONNECTED TOGETHER BY A FORGOTTEN WIRE ON ONE OF THEM

Correct wiring:



Wiring produced:



Test requested:

EI B [2] B [3] B [6] B [7] B [9] .

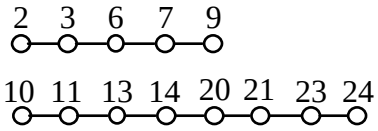
EI B [1O] B [11] B [13] B [14] B [20] B [21] B [23] B [24] .

Test result:

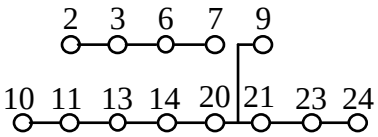
Continuity measurement error A [2] B [3]

Insulation measurement error A [10] B [3] B [6] B [7] B [9]

Correct wiring:



Wiring produced:



Test requested:

EI B [2] B [3] B [6] B [7] B [9] .

EI B [1O] B [11] B [12] B [14] B [20] B [21] B [23] B [24] .

Test result:

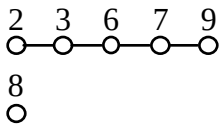
Continuity measurement error A [2] B [9]

Insulation measurement error A [10] B [9]

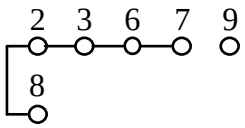
Same remark: The tester will only detect one error between the start of the second chain and point 9.

C.II.11 ISOLATED POINT WIRED IN A CHAIN POINT POSITION

Correct wiring:



Wiring produced:



Test requested:

EI B [2] B [3] B [6] B [7] B [9].

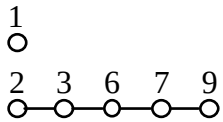
EI B [8].

Test result:

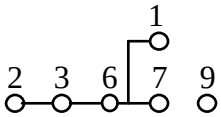
Continuity measurement error A [2] B [9]

Insulation measurement error A [8] B [2] B [3] B [6] B [7]

Correct wiring:



Wiring produced:



Test requested:

EI B [1] .

EI B [2] B [3] B [6] B [7] B [9] .

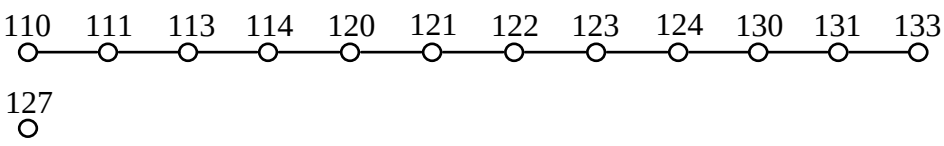
Test result:

Insulation measurement error A [2] B [1]

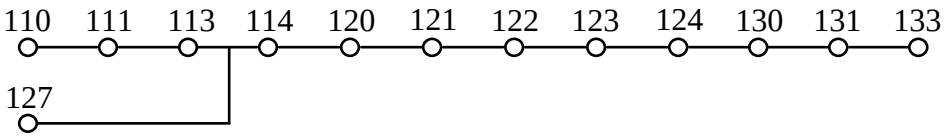
Continuity measurement error A [2] B [9]

C.II.12 ISOLATED POINT WIRED ON A LONG CHAIN

Correct wiring:



Wiring produced:



Test requested:

EI B [110] B [111] B [113] B [114] B [120] B [121] B [123] B [124] B [130] B [131] B [133].

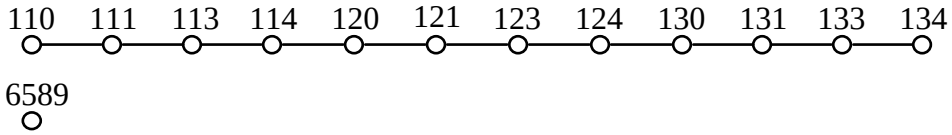
EI B [127].

Test result:

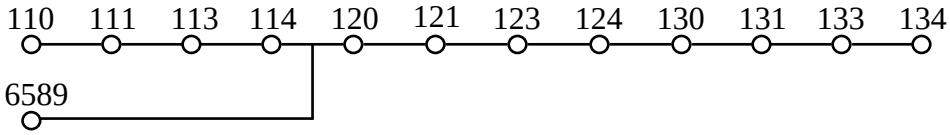
Insulation measurement error A [127] B [110] B [111] B [114] B [120] B [121] B [123] B [124]

This example shows that the tester never goes beyond the faulty point in its search.

Correct wiring



Wiring produced:



Test requested:

EI B [110] B [111] B [113] B [120] B [121] B [123] B [124] B [130] B [131] B [133] B [134] .

EI B [6589] .

Test result without limited search:

Insulation measurement error A [6589] B [110] B [111] B [113] B [114] B [120] B [121] B [123] B [124] B [130] B [131] B [133] B [134]

The same test on the same wiring with limited search programmed to 4 points, gives:

Insulation measurement error A [6589] B [110] B [111] B [113] B [114] LIMITED SEARCH

In this example, we see that the faulty additional wire connected to the connection chain only appears when the insulation of the single point [6589] is tested, i.e. after the chain has been tested with a "passed" result.

This confirms the rule requiring that all the points appear in a test program.

C.II.13 INSULATION TEST BETWEEN TWO POINTS

Wiring:

Test requested:

I A [200] B [300]

If the programmed insulation value is less than 15 MΩ the test is passed.

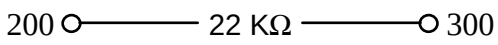
If the programmed value is greater than 15 MΩ the test is failed.

In the second case, the test result is:

Insulation measurement error A [200] B [300]

C.II.14 CASE OF RESISTORS WHOSE VALUE IS BETWEEN THE CONTINUITY RANGE AND THE INSULATION RANGE

Wiring:



Test requested:

EI B [200] B [300] .

Test result:

Continuity measurement error A [200] B [300]

Insulation measurement error A [300] B [200]

The continuity test of 200 in relation to 300 is failed, even if 100 is programmed. After this failed test, point 300 becomes the generator for an insulation test in relation to the lower address points.

This insulation test is failed even if 01 MΩ is programmed. This is the only case when the same points are listed as faulty for continuity and insulation.

If the same resistor (22 KΩ) is tested with the program:

I A [200] B [300]

The test result is:

Insulation measurement error A [200] B [300]

regardless of the reject value.

If you need to measure this resistance more accurately, it can be tested:

either with the program N W A [200] B [300]

or with the program I A [200] B [300] with stopping on error (F5).

The second case requires a failed test result.

In both cases, points 200 and 300 will be available on the EXTERNAL OUTPUT socket.

The resistance can then be measured manually with an ohmmeter.

For more exact measurements, there is a "resistance measurement" option.

C.III DOCUMENTS FOR ANALYSING THE ERROR LIST

To analyse a results list, the operator should always forget the tester. The list showing tester points is only useful to the programmer when debugging is necessary, as the transcoding allows him to interpret errors directly by reading the wiring diagram.

Put briefly, this requires:

1 – the error list showing user points,

2 – the equipment wiring diagram.

C.IV ANALYSIS OF THE RESULTS

The error list reported by the tester cannot generally be used directly by the wirer responsible for repairs unless he/she has received a minimum of training. The operator must therefore proceed as described below if he/she has the documents referred to in the previous chapter.

- Process each paragraph of the error list thoroughly, clearly mentioning the repair to be made (not forgetting that the wiring order is rarely the same as the order of tester addresses). Check that a chain is not affected by several errors with other chains, forming several paragraphs. This will require use of the wiring list.

The entire error list must therefore be processed in a single operation.

NOTE: *If there is a faulty interface contact on a continuity test, the tester will indicate an insulation fault and a continuity fault on the same points.*

If this contact is lost completely, the tester will indicate a continuity fault which will not be found on the equipment. If this fault repeats itself, check the interface.

In the case of an insulation fault on a long chain, the tester will indicate the chain and the faulty point, but will not indicate the exact location at which the surplus wire arrives. The wire must therefore be traced back from the faulty point to the chain, but the exact point of arrival can only be determined visually.

If breakdown occurs because of a damaged wire (frequently the case if wires are wrapped), the tester may, for some configurations, only indicate a single point on the error list corresponding to the "point not found" or "parameters too high" message.

This is due to the fact that at high voltage levels, the faulty point causes a breakdown that the tester detects as a fault, but during the search, since the configuration and number of points are no longer the same, the breakdown is not repeated and the tester does not detect it as a fault.

In such cases, if the test is repeated at a lower voltage, the fault is often no longer detected because there is no longer breakdown.

- If incorrect insulation parameters are selected or the insulation materials of the equipment to be tested are of poor quality, the tester, as above, cannot find the second faulty point (poor insulation on a group of 1000 points but good on a few points). In this case the message "point not found" or "parameters too high" appears.

- In every case, it is important to distinguish between short circuit, insulation fault or breakdown.

C.V ADVICE FOR REPAIRS

A – It is possible to carry out repairs with the equipment connected. In some cases, the time required to connect and disconnect the interface is such that it is best to immobilise the tester and carry out repairs on the spot. To do this, the external output (programmed or manual) is useful as the tester can be stopped on 2 test points and their status can be established using an ohmmeter until the repair is finished.

*The measuring device must **NEVER** exceed the tester characteristics, i.e. **MAXIMUM VOLTAGE** and **CURRENT** allowed by the switching matrix.*

*Dielectrimeters and breakdown meters are **STRICTLY FORBIDDEN**.*

In the case of an external output on a multiple insulation test, all or some of the points are short-circuited as the relays remain in place. Select **STOP TEST** to look for a fault on the equipment with an ohmmeter.

After each repair, it is wise to carry out manual continuity and insulation tests on the chain(s) affected by the fault.

During repairs, be sure to clean the equipment to be repaired before reconnecting it to the tester, especially if the required insulation test involves high quantities.

However carefully repairs are carried out, they still sometimes produce new faults. The equipment must therefore be checked on the tester until it produces a fault-free list.

In this case, a partial test using the address search is not enough. All the tests must be repeated.

B – Do not forget the role of the probe. This shows the points affected on the wiring on a table matching the tester point, intermediate interface point and user point.

NOTE: *There are two restrictions to using the probe: low-level and stimuli.*

C – In the case of breakdown, as a general rule, if the error result for a breakdown is in Volts, the fault will have occurred during the voltage rise time. You should therefore look for a surface defects or a elements placed too close to each other (damaged wire, poor solder, etc.) If the result is in milliseconds, and therefore seen during the application time, look for substrate contamination (printed circuit cleaning, trace of flux, etc.).

D. PROGRAMMING INSTRUCTIONS

In addition to the switching matrix, the tester also has a measuring unit controlled by a PC type microcomputer.

This PC provides the dialogue allowing the operator to create test files using WINPASS software.

All programming, modifying and editing possibilities are accessed via the WINPASS editor.

Under this heading, an editor provides all the actions possible on the files. There is a programming aid allowing transcoding tables to be set up without worrying about the syntax.

D.I INSTALLING PROGRAMS

D.I.1 PC CONFIGURATION

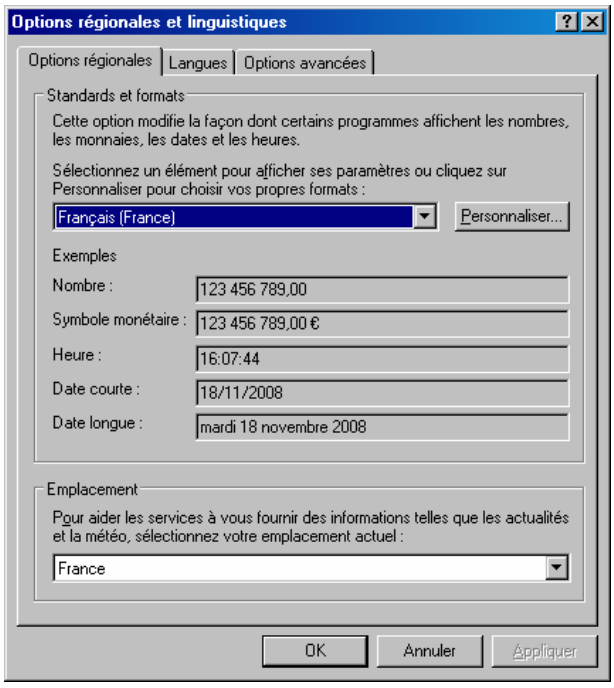
The **SYNOR 4200** software can only run on a PC equipped with a WINDOWS® XP operating system.

NB: *refer to the Microsoft manuals for how to use and choose these software programs.*

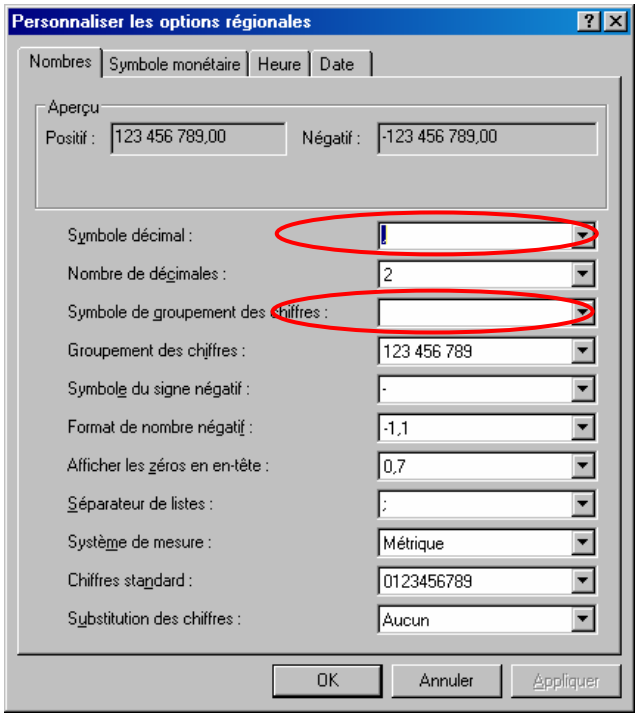
D.I.2 WINDOWS REGIONAL SETTINGS FOR WINPASS

The WINPASS software is independent from WINDOWS, however some WINDOWS settings may result in conflicts of interpretation in WINPASS. The following regional settings must be modified and monitored:

In “control panel”/”Regional options, date, time and language”/”Regional and language options”


Options régionales et linguistiques
Options régionales
Langues
Options avancées
Standards et formats
Cette option modifie la façon dont certains programmes affichent les nombres, les monnaies, les dates et les heures.
Sélectionnez un élément pour afficher ses paramètres ou cliquez sur Personnaliser pour choisir vos propres formats :
Français (France)
Personnaliser...
Exemples
Nombre : 123 456 789,00
Symbole monétaire : 123 456 789,00 €
Heure : 16:07:44
Date courte : 18/11/2008
Date longue : mardi 18 novembre 2008
Emplacement
Pour aider les services à vous fournir des informations telles que les actualités et la météo, sélectionnez votre emplacement actuel :
France
OK
Annuler
Appliquer

In the next window, click on “personalise”.



In the “numbers” tab

The value for “*Decimal symbol*” must be a comma: “,”

The value for “*Figure grouping symbol”* must be a space: “ “

D.I.3 CARRYING OUT THE INSTALLATION

Testers are delivered with a CD ROM containing the WINPASS software, options and tester configuration.

Simply insert the CD ROM in the drive and the program loads automatically. The installation software lets you choose the work directories. To accept the default directories, click on NEXT in each prompt.

NB: *If the testers are in network, you must be in administrator mode and the operation files must be on the PC disk.*

D.I.4 DESCRIPTION OF THE INSTALLATION

The installation program copies the whole **SYNOR 4200** software into a particular directory of your PC.

In standard mode, the following directories are proposed:

C:\PROGRAM FILES\SEFELEC\WINPASS

This directory contains the tester operation software.

C:\SEFELEC\WINPASS

This directory contains configuration files likely to be modified by the operator.

The test files will be saved to directories chosen by the user.

ATTENTION: *Test files must never be saved to* C:\PROGRAM FILES\SEFELEC\WINPASS *as they may be deleted during updates.*

ATTENTION: *When installing for the first time, WINPASS must be installed before the PCI (40528) interface card is inserted. Then unplug the PC from the mains, insert the card in the PCI slot and plug in the tester connection cable. Start the PC up again, and WINDOWS will install the interface card automatically. WINPASS is ready to operate with the TESTER*.

D.I.5 UPDATING WINPASS

Before updating WINPASS, the previous version must be deleted.

Up to WINPASS 5.03 (version installed on your PC), proceed as follows:

Uninstall WINPASS from Windows and the “add/delete a program” option situated in the control panel. Then delete the “control.liv” file situated in C:\WINDOWS\SYSTEM32 manually. You are now ready to install the new version of WINPASS.

From WINPASS 5.04 (version installed on your PC), proceed as follows:

Insert the installation CD, select “remove” to delete the previous version and follow the instructions for deleting the previous version.

Relaunch the installation program. Follow the instructions for installing the new version.

D.II DESCRIPTION OF THE SOFTWARE

The **SYNOR 4200** tester is delivered with a pack containing the files required for installing the tester software and its editor.

D.II.1 FILE MANAGEMENT

The PC is delivered with specific documentation (see supplier's manual), recalling how it works.

The WINDOWS® operating systems are supplied with educational software.

All actions on files (copy, delete, etc.) and floppy disks (formatting) will be carried out using WINDOWS® utility programs.

D.II.2 OPERATING FILES

The tester needs several files to function, in which all the information is provided for a series of tests.

The file names are composed of alphanumerical characters and a 3-character extension imposed by the tester software according to the description below.

For a series called DEMO, the tester will use:

DEMO.TES: file containing the test program in user points

DEMO.COR: file containing the equivalence table:

Machine points ⟶ User points;

DEMO_n.RES: file containing the test results for processing elsewhere

NOTE: *The *.TES and *.COR files are in text format and can be processed by text processing or a conventional spreadsheet. The system's operation files are stored in the sub-directory C:\PROGRAM FILES\SEFELEC\WINPASS; it is strongly advised not to carry out any operation in this zone.*

DEMO.CNT: file containing a library of connectors

D.II.3 SYNTAX

In what follows, the following convention is taken: the instructions are symbolised by rectangle assemblies in which the key words used by the **SYNOR 4200** software are written in bold.

SEFELEC tries, as far as possible, to ensure the compatibility of its software programs with previous versions. Some codes no longer appearing in the following description are, in principle, always interpreted.

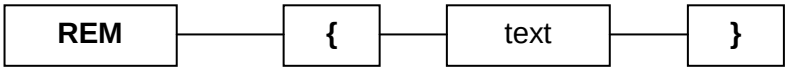
ATTENTION: *The keywords are case-sensitive, so upper and lower case must be correctly used. The editor operates one line at a time, so it is essential to only programme one instruction per line.*

NB: *When writing the program, it is important to only write one instruction per line, irrespective of the editor used.*

From version 6.01, the WinPass EDITOR is equipped with automatic syntax colouring. This colouring has no effect on the programming. Its purpose is to help with the presentation and reading of a program. The choice of colours cannot be set.

D.II.3.1 Commodities – text, image and dialogue box functions

a Comment



A comment is not registered in the wiring test program. It does not appear on the screen or on the printer during the test.

It simply allows the programmer to enter comments into his program, which are visible when editing the test file.

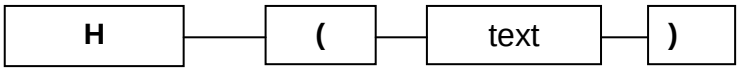
Example:

- From the **EDITOR**

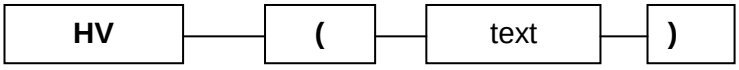
REM tester demonstration program

b Text function/Messages for the operator

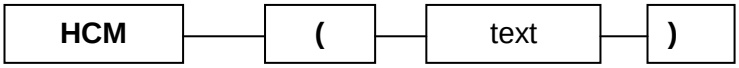
The text is displayed on the screen, sent to the printer and saved in a results file (if requested).



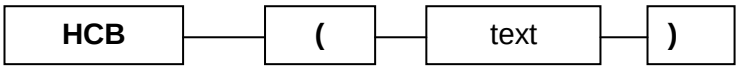
The text is only displayed on the screen



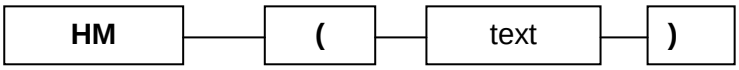
The text concerns the previous tests. It is edited if one of the previous tests fails. It is written on the screen and printer. This code remains compatible with the old **HC** (WINPASS versions earlier than 4.00)



The text concerns the previous tests. It is only edited if all of the previous tests are correct. It is written on the screen and printer.



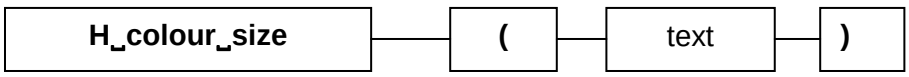
This keyword allows the operator to enter a text from the keyboard during the test. The text may be, for example, the operator's name or a test report.



NB: *During the test, the printer can be disabled in the configuration at any time.*

With the default settings, previous codes produce a black text. The size and font are set in the SOFTWARE CONFIGURATION. This section is available in the TESTER menu.

However, for instructions **H, HV, HCM, HCB,** and **HM**, the colour and size can be programmed. The command is only valid for the current instruction. If these definitions are not entered, the default colour and size are used.



Colour*:* only four letters are recognised: **N** black, **B** blue, **R** red and **V** green.

Size: sizes 8 to 48 are available*.*

Example*:*

- From the **EDITOR**

Instruction "H c n (*text*)"

H V 10 (Please connect the SUB-D9 connector)

H V 10 (Please connect the DEUTSCH connector)

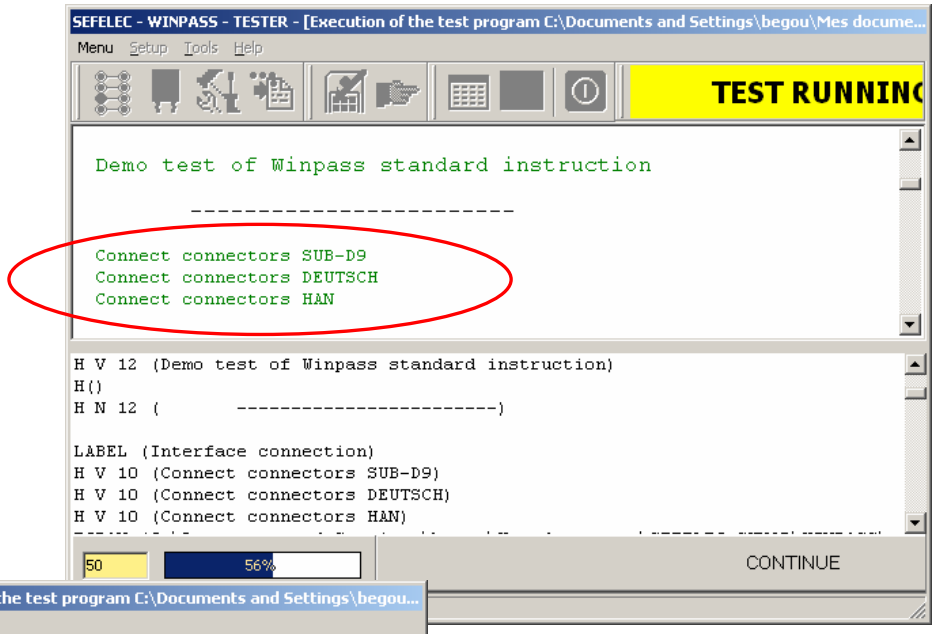
H V 10 (Please connect the HAN connector)

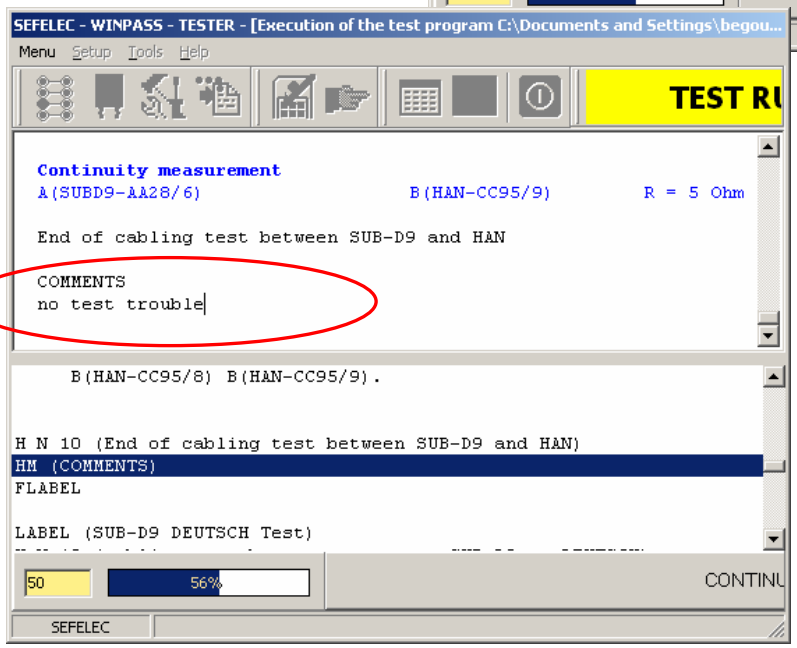
Instruction, typewriter mode, “HM c n (*text*)”

HM R 14 (Comments)

- From the **TESTER**

Instruction “H c n (*text*)”


SEFELEC - WINPASS - TESTER - [Execution of the test program C:\Documents and Settings\begou\Mes docume...
Menu Setup Tools Help
TEST RUNNING
Demo test of Winpass standard instruction
Connect connectors SUB-D9
Connect connectors DEUTSCH
Connect connectors HAN
H V 12 (Demo test of Winpass standard instruction)
H()
H N 12 ( )
LABEL (Interface connection)
H V 10 (Connect connectors SUB-D9)
H V 10 (Connect connectors DEUTSCH)
H V 10 (Connect connectors HAN)
50
56%
CONTINUE



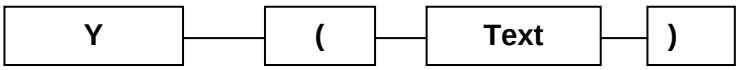
Instruction, typewriter mode, “HM c n (*text*)”.

The operator can enter free text using the keyboard. You must click on “CONTINUE” to resume the test.

c Stopping/Pausing the program

This keyword **Y** stops the test while it is running. A dialogue box indicates that the test has been stopped and tells the user to click when he wants the test to continue.

A text can be attached to this code in order to provide a user instruction making it easier to identify the stop. This text will appear in the dialogue box. It is limited to 60 characters.

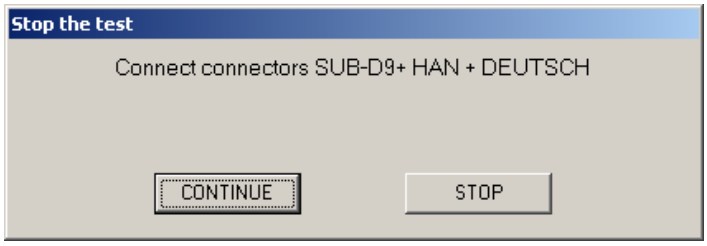


Example:

- From the **EDITOR**

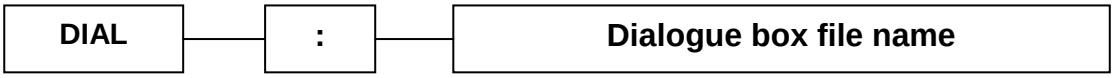
```
Y (Connect connectors SUB-D9 + HAN + DEUTSCH
```

- From the **TESTER**



While the program is running, a dialogue box appears, interrupting the test under way, and until the operator clicks on “CONTINUE” or “STOP”, the test stays on pause.

d Dialogue box



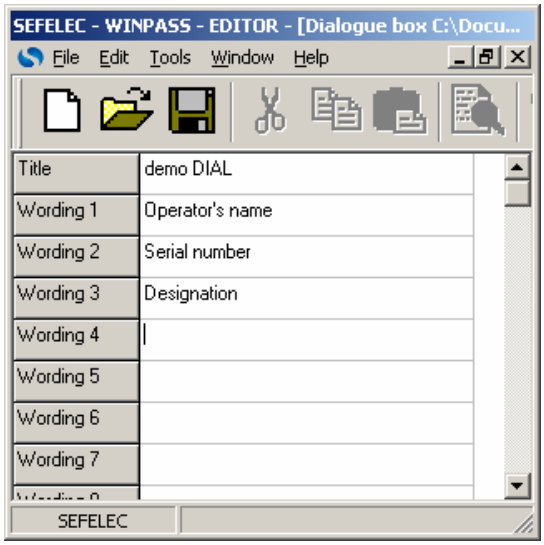
Used to compile a dialogue box of 1 to 10 fields. Filled in at each test by the operator, these fields are printed on the test list. Some fields can be used to fill in the results file name (see user's manual).

The text can be added in one of the fields (1 to 9) of a dialogue box, in a text of the type H ( ). The dialogue box used will be the last one programmed in the test sequence.

Code **n** (1 to 9) gives the text of the corresponding field of the dialogue box.

Example:

- Creation of the dialogue box from the **EDITOR** and the "creation of the dialogue box" tool.

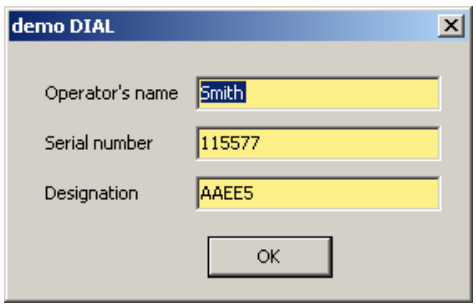


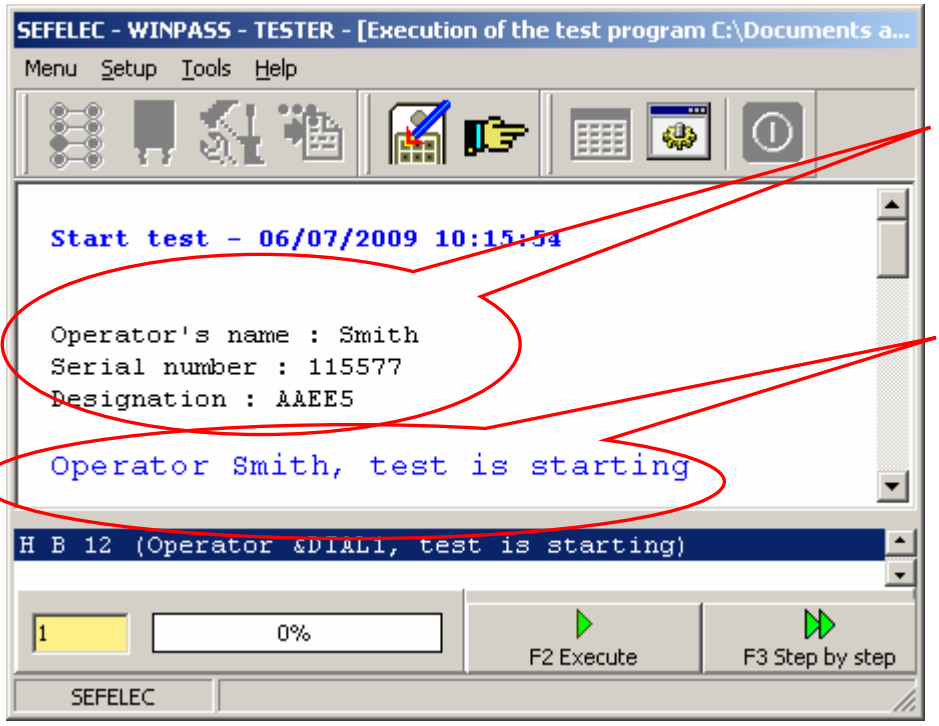
Call up the dialogue box when writing the test program from Winpass editor.

DIAL C:\sefelec\DEMOWINPASS\dial demo.DIA

H B 12 (Opérateur &DIAL1, start test)

- From the **TESTER**, the following dialogue box appears to allow the operator to fill in the different fields.




SEFELEC - WINPASS - TESTER - [Execution of the test program C:\Documents a...
Menu Setup Tools Help
Start test - 06/07/2009 10:15:54
Operator's name : Smith
Serial number : 115577
Designation : AAEE5
Operator Smith, test is starting
H B 12 (Operator &DIAL1, test is starting)
1
0%
F2 Execute
F3 Step by step
SEFELEC

Once the dialogue box has been validated by the operator, the fields filled in by the operator appear in the test results.

The text instruction "H B 12 (Operator &DIAL1, test is starting)" with variable appears in the test results. The variable is replaced by the value filled in in the dialogue box. (see the "test variable" chapter for more information".

The **NDIAL** function is used to display the dialogue box as **DIAL** but its content is not visible in the results list. To use the various fields, modify the **&DIALn** codes in the brackets of text codes **H c t ( )**, where **n** is the field number. The results file configuration is unchanged.

NDIAL	:	Dialogue box file name

e Screen/image function

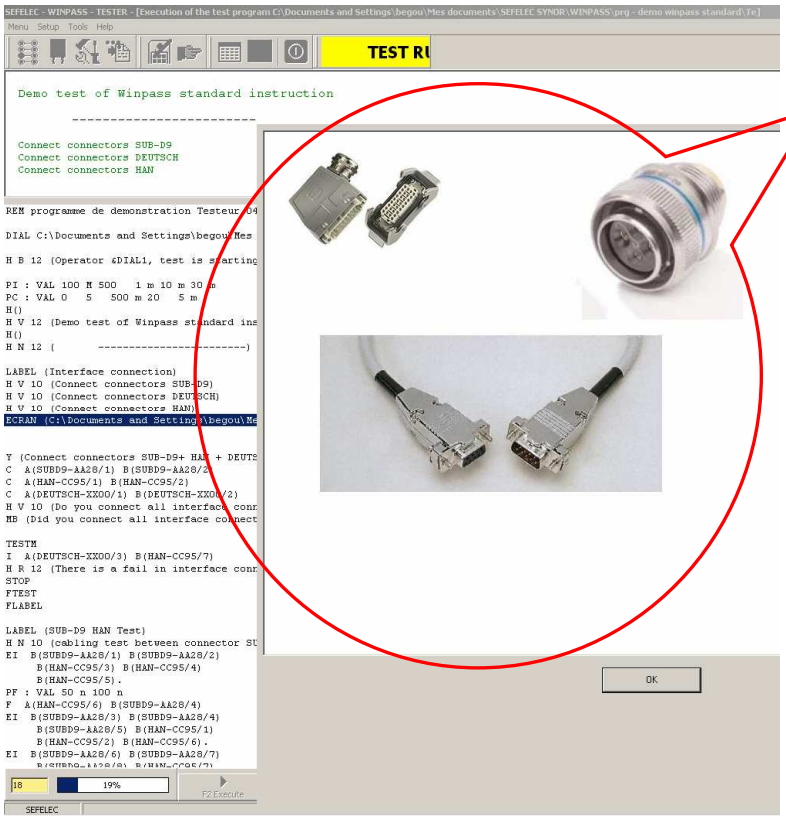
This function is used to display TXT, HTM, BMP and JPG files. During the test, when this instruction is being carried out, the Winpass tester moves into the background and the desired file appears. The operator validates by clicking OK to resume the test.

Example:

- From the **EDITOR**.

SCREEN (C:\Documents and settings\WINPASS\connecteur interface.JPG)

- From the **TESTER**.



The image specified in the instruction arborescence appears. The operator must validate by clicking "OK" to continue the test.

f Message box/question for the operator

A message box can be made to appear on the screen with the possibility of replying YES or NO.

MB	**(**question**)**

In the second form, it is possible to make another text appear depending on the reply YES or NO.

MB	**(question)**	**(**answer if YES**)**	**(**answer if NO**)**

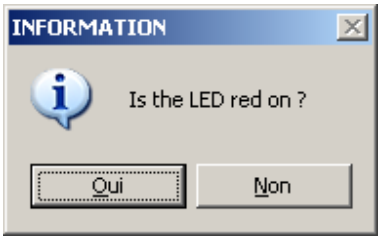
NOTE: A "NO" answer in this dialogue box will lead to a FAILED test result, even if all the other results have passed.

***Example**:*

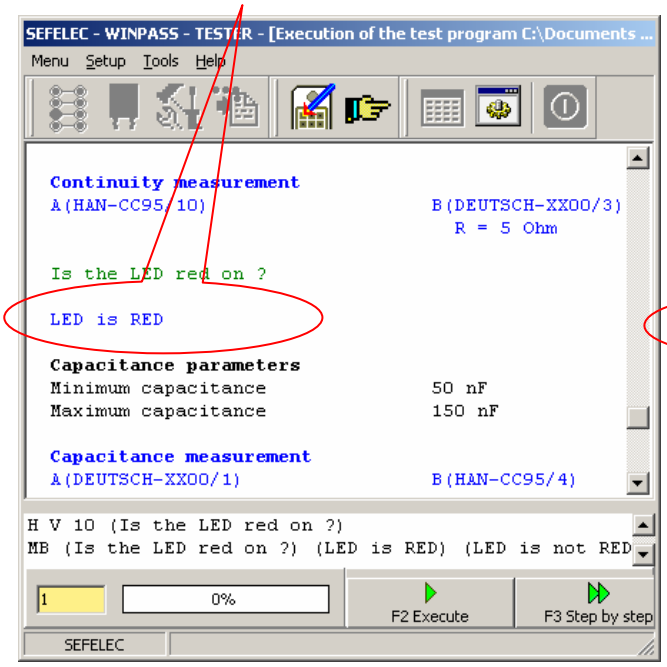
- From the **EDITOR**

```
MB (Is the LED red on ?) (LED is RED) (LED is not RED)
```

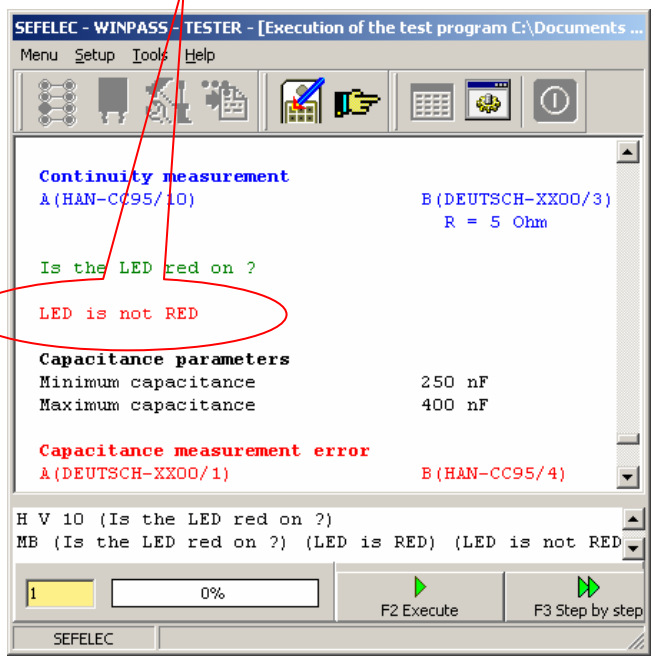
- From the **TESTER**, the following dialogue box appears on the screen when the instruction is being carried out.



If the answer is **YES**, the following text appears.

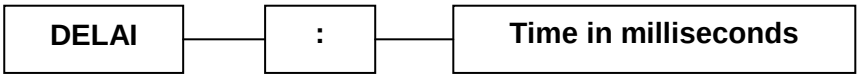

SEFELEC - WINPASS - TESTER - [Execution of the test program C:\Documents ...
Menu Setup Tools Help
Continuity measurement
A(HAN-CC95/10) B(DEUTSCH-XX00/3)
R = 5 Ohm
Is the LED red on ?
LED is RED
Capacitance parameters
Minimum capacitance 50 nF
Maximum capacitance 150 nF
Capacitance measurement
A(DEUTSCH-XX00/1) B(HAN-CC95/4)
H V 10 (Is the LED red on ?)
MB (Is the LED red on ?) (LED is RED) (LED is not RED
1
0%
F2 Execute
F3 Step by step
SEFELEC

If the answer is **NO**, the following text appears.


SEFELEC - WINPASS - TESTER - [Execution of the test program C:\Documents ...
Menu Setup Tools Help
Continuity measurement
A(HAN-CC95/10) B(DEUTSCH-XX00/3)
R = 5 Ohm
Is the LED red on ?
LED is not RED
Capacitance parameters
Minimum capacitance 250 nF
Maximum capacitance 400 nF
Capacitance measurement error
A(DEUTSCH-XX00/1) B(HAN-CC95/4)
H V 10 (Is the LED red on ?)
MB (Is the LED red on ?) (LED is RED) (LED is not RED
1
0%
F2 Execute
F3 Step by step
SEFELEC

D.II.3.2 Delay / time out - STOP

a Delay / time out



When this instruction is being carried out, a pause will occur. The pause time will be the same as the time given by the instruction in ms.

Example:

- From the **EDITOR**

```
C  A[1]  B[2]
DELAI 100
I   A[4]  B[6]
```

This instruction does not display text during the test on the Winpass Tester or on the test report. Between the 2 instructions "**C** A[1] B[2]" and "**I** A[4] B[6]", a pause of 100ms will be taken into account.

b STOP

In a conditional **TESTB** and **FTEST** zone for example, the **STOP** function stops the test. It can be used to stop the test series if a condition is not met.

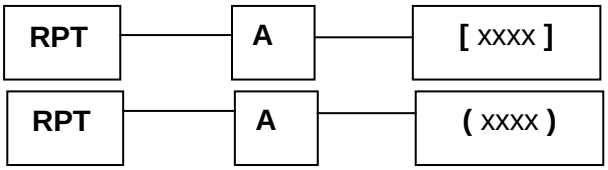
Example:

- From the **EDITOR**

```
TESTM
H R 12 (Following a connection error, the test will be stopped)
STOP
FTEST
```

D.II.3.3 Search probe

The search probe can be called up in a program and used as test point:



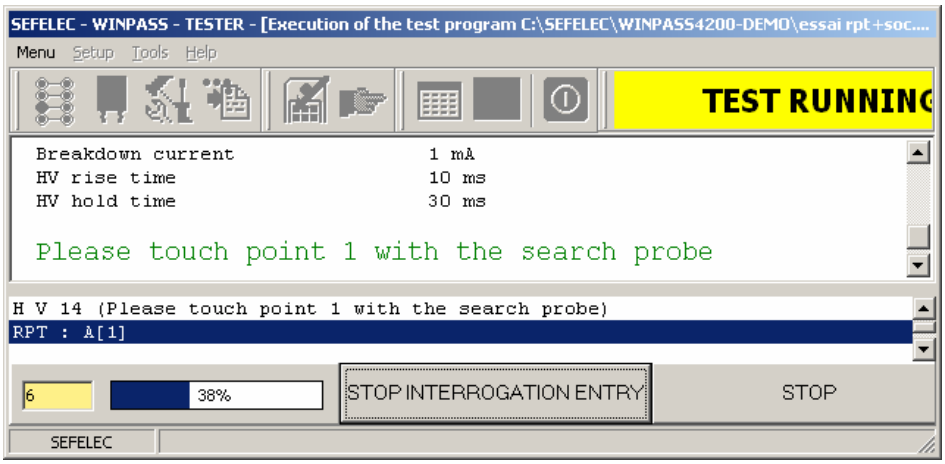
If the point touched does not have the programmed address between brackets, a failed test is declared and an error message is displayed.

***Example*:**

- From the **EDITOR**

```
H V 14 (Please touch point 1 with the search probe)
RPT  A[1]
```

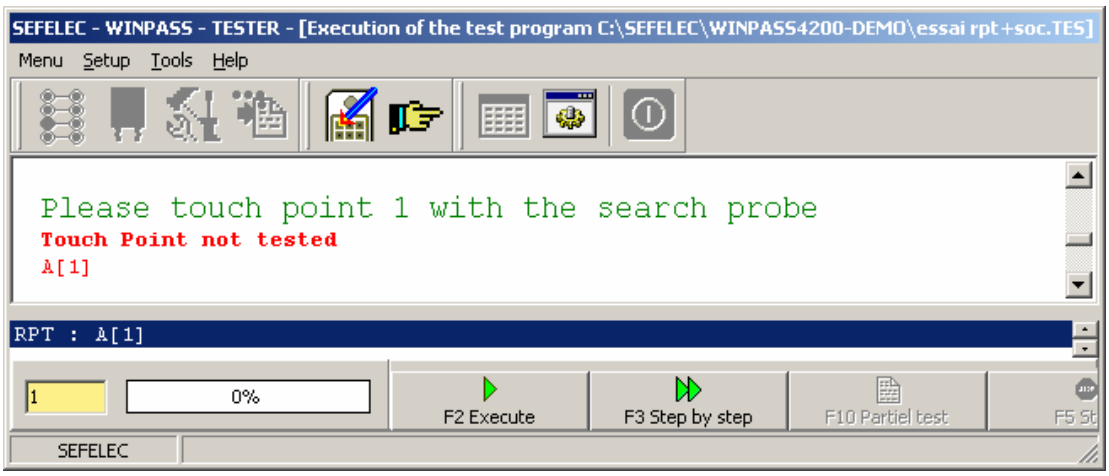
- From the **TESTER**


SEFELEC - WINPASS - TESTER - [Execution of the test program C:\SEFELEC\WINPASS4200-DEMO\essai rpt+soc....
Menu Setup Tools Help
TEST RUNNING
Breakdown current 1 mA
HV rise time 10 ms
HV hold time 30 ms
Please touch point 1 with the search probe
H V 14 (Please touch point 1 with the search probe)
RPT : A[1]
6
38%
STOP INTERROGATION ENTRY
STOP
SEFELEC

The operator must then use the search probe and put it in contact with the programmed point.

Once this had been done, the operator must validate by clicking "Stop interrogation entry" or "STOP".

If the point requested has been touched, the test is considered PASSED. If the point touched is not the right one or if no point is touched, the test is considered FAILED.



D.II.3.4 High/low level swing – GO NO GO

a High/low level swing

HN

Authorises the test with the “high-level” parameters. The “high-level” test is applied by default.

BN

Authorises the test with the “low-level” parameters. Several test zones can follow in the same file.

NB: *After a HL or LL, the continuity (PC) or insulation parameters (PI) must be redefined for the following tests.*

b GO NO GO test

Code for a go – no go test at maximum speed.

GN

This is not a quality test.

D.II.3.5 Chapter/Label

For long programs requiring operations such as connections, switching or stimuli commands, it is possible to divide the test into several zones each with its own name or LABEL.

If LABELS are present in the test file, the zone(s) to be tested in the same test program can be selected using a button on the "PARTIAL TEST" Winpass Tester screen. By default, the tester executes the complete file.

The syntax is as follows:

LABEL(Name_Label)	Test zone	FINLABEL

Example:

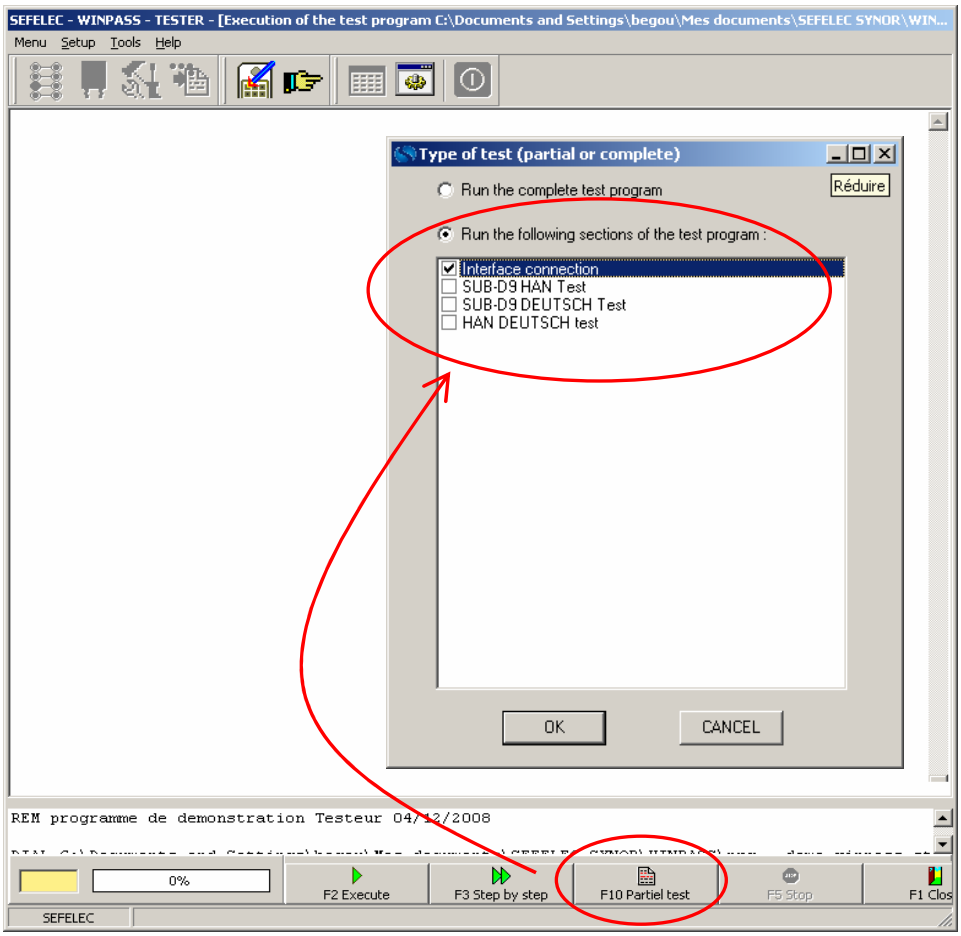
- From the **EDITOR**

```
LABEL (connection of interfaces)
H V 10 (Please connect the SUB-D9 connector)
H V 10 (Please connect the DEUTSCH connector)
H V 10 (Please connect the HAN connector)
ENDLABEL
```

- From the **TESTER**

Once the test program is loaded, it is possible to select "PARTIAL TEST" in the test control bar. Then, in the PARTIAL TEST dialogue box, it is possible to view the list of LABELS created in the program and to select a combination of them.

Once validated, only the instructions included in the selected LABELs will be carried out.



D.II.3.6 Conditional zones

a Zone executed if all tests have PASSED

A series of instructions may be inserted between TESTB and FTEST that will only be carried out if all the tests preceding this zone have passed.

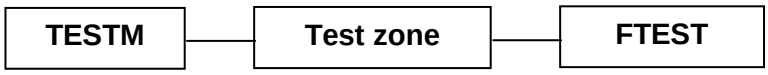
Example:

- From the **EDITOR**

```
TESTB
PF : VAL 50 n 150 n
F    A[4]  B[6]
FTEST
```

The tester will carry out the instructions between the zone marked out by TESTB and FTEST only if all the tests preceding this zone have PASSED. If just one test fails, these instructions will not be carried out.

b Zone executed if one of the tests has FAILED



A series of instructions may be inserted between TESTM and FTEST that will only be carried out if one of the previous tests has FAILED.

For example, "**STOP**" instruction.

Example:

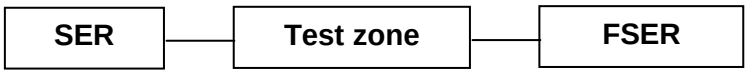
- From the **EDITOR**

```
TESTM
PF : VAL 50 n 150 n
F    A[4]  B[6]
STOP
FTEST
```

If all the tests preceding this zone have PASSED, the tester will continue the test by ignoring the instructions in this zone.

If one of the tests preceding this zone has failed, the instructions in the zone will be carried out.

c Zone executed only in the first test



A series of instructions may be inserted between SER and FSER that will only be carried out once during the first test, after a file is loaded.

Example:

- From the **EDITOR**

The "DIAL" instruction between the "SER" and "FSER" instructions will be carried out the first time the test program is launched. If this program is run through again or relaunched at the end of the test, the "DIAL" instruction will not be carried out again.

```
SER
DIAL C:\Documents and Settings\WINPASS\dialogue demo.DIA
FSER
```

D.II.3.7 Test parameters

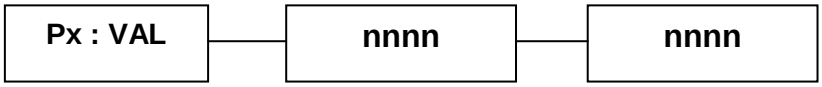
To carry out a measurement, the tester must be given the parameters controlling the different generators and the PASSED test criteria. A parameter is given in the program before the test instructions. It is possible to change parameters as many times as necessary in a test file. However, there is no need to repeat the parameter instruction before each test if it does not change. The last programming is taken into account.

The main solution involves defining all of the values of a measurement parameter in the test file. This possibility has the advantage of linking the parameters to the test file and enables it to be exported on to any tester of the same type.

In the old syntax modes, it is possible to call on parameter libraries. With this solution, the parameters belong to the tester. The test files cannot be exported without checking that the parameter tables are the same on both appliances (this solution is used on the old modernised SYNOR testers). In addition, the parameters do not appear on the test results file.

Syntax of parameters programmed in the test file

- Value per range



X: type of parameter (see list below)

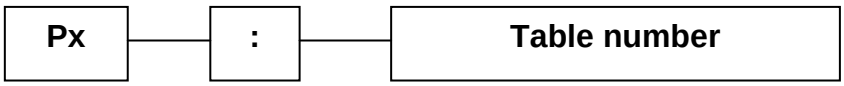
The minimum and maximum values are given in scientific notation (e.g. 100 = 10E1) and in the standard units of the **IS** system (Ω, F, s, etc. with the indicators p, n, µ, m, k, M and G).

Syntax of the old setting modes

The two following modes, although obsolete, are still valid to ensure the compatibility of the old Tester generation program.

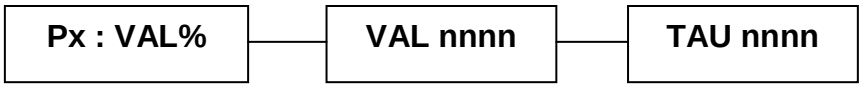
The parameter library : (can only be used for the old DOS versions)

The parameter number must lie between 0 and 99. A section of the EDITOR can be used to fill in 100 different tables per measurement group.



X: type of parameter (see list below)

- **value per percentage**



The nominal value is given in scientific notation while the tolerance is in a direct value between 1 and 100.

The different standard measurement parameters of the tester

Parameter type	Parameter syntax
DC insulation	**PI: VAL** R threshold insulation U I breakdown HV rise t HV application t
DC dielectric strengh	**PId: VAL** insulation U I breakdown HV rise t HV application t
Continuity	**PC: VAL** minimum R maximum R I test maximum U application t
Resistance	**PR: VAL** minimum R maximum R application t I test range
Capacitance	**PF: VAL** minimum capacitance maximum capacitance
Shielding	**Pb: VAL** minimum capacitance maximum capacitance
4-wire continuity	**P4: VAL** minimum R maximum R I test maximum U application t
4-wire resistance	**PR4: VAL** minimum R maximum R application t I test range
Diode	**Pd: VAL** minimum U maximum U I test
Zener diode	**Pdz: VAL** minimum U maximum U I test

NB: *For the 2 and 4-wire resistance measurement (**PR** and **PR4**), if the value entered for "I test range" (current range) is "**0**", the tester will use an automatic current range.*

Reminder of the measurement parameters table

MEASUREMENTS	PARAMETERS	MIN. VALUE	MAX. VALUE
INSULATION	Threshold resistance	50 kΩ	2000 MΩ
INSULATION & dielectric strengh	Insulation U	20 V	2000 V
INSULATION & dielectric strengh	Rise time	10 ms	99 s
INSULATION & dielectric strengh	Application time	10 ms	99 s
INSULATION & dielectric strengh	I breakdown	500 µA	10 mA
2 & 4-wire CONTINUITY	I test	10 mA	2 A
2 & 4-wire CONTINUITY	Maximum U	5 V	20 V
2 & 4-wire CONTINUITY	Time	3 ms	99 s
2-wire CONTINUITY	min / max R	0,5 Ω	250 Ω
4-wire CONTINUITY	min / max R	1 mΩ ≥1 A	250 Ω
2 & 4-wire RESISTANCE	Time	3 ms	99 s
2 & 4-wire RESISTANCE	Current range	1 µA	10 mA
2-wire RESISTANCE	Resistance	10 Ω	10 MΩ
4-wire RESISTANCE	Resistance	100 mΩ	10 MΩ
DC CAPACITANCE	Capacitance	100 pF	100 000 µF
SHIELDING	Capacitance	50 pF	1 µF
DIODES	Current	10 mA	2 A
	Voltage	100 mV	20 V
ZENER DIODES	Test voltage	20 V	100V
	Zener voltage	20 V	90 V

The different parameters available depending on the tester options

Parameter type	option	Parameter syntax
dielectric strength AC	AC Generator (34019)	**PJ : VAL** U insulation I breakdown HV rise t application t
Vcc measurement	ZLC or 40535	**PVC : VAL** minimum voltage maximum voltage
Vca measurement	ZLC	**PVA : VAL** minimum voltage maximum voltage
Inductance	ZLC	**PLR : VAL** minimum inductance maximum inductance
Capacitance in alternating current	ZLC	**PCR : VAL** minimum capacitance maximum capacitance
Inductor coil impedance	ZLC	**PZL : VAL** minimum impedance maximum impedance
Capacitive impedance	ZLC	**PZC : VAL** minimum impedance maximum impedance
GMOV	GMOV	**PGM : VAL** minimum voltage maximum voltage test voltage series resistance application time
Voltage generation on measurement switching	U generation	**PGU : VAL** voltage
Voltage generation/current on measurement switching	U generation (40549)	**Pu : VAL** voltage current
External power supply on measurement switching	U generation + external ps	**Pue : VAL** voltage current
External power supply 1 or 2 on Stimuli switching	Stimuli with external ps	**Pus*n* : VAL** current voltage (*n* = 1 or 2)

NB: *The parameters must always be indicated before the zone in which they are to be applied. A new parameter cancels out the previous one of the same type.*

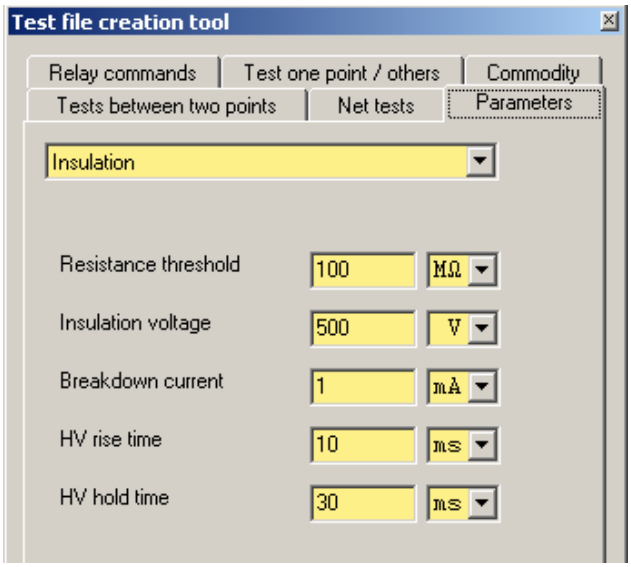
Reminder of the optional measurement parameters table

MEASUREMENTS	PARAMETERS	MIN. VALUE	MAX. VALUE
dielectric strength AC	AC voltage	50 Veff	1500 Veff
	Rise time	500 ms	99 s
	Application time	20 ms	99 s
	Breakdown	500 µA	10 mA
Vcc MEASUREMENT	Voltage	0	1000V
Vca MEASUREMENT	Voltage	0	750V
INDUCTANCE	Resistive	10µH	200 H
CAPACITANCE IN AC	Capacitance	100 pF	2 000 µF
INDUCTOR COIL IMPEDANCE	Inductor coil	100 µH	200 H
CAPACITIVE IMPEDANCE		100 mΩ	160 kΩ
GMOV	Voltage	0	360V
	Series resistance (nb)	1	7
	Time	2ms	99s
Voltage generation	Voltage	4 V	100 V
Current voltage generation	Voltage	5 V	25 V
	Current	10 mA	1 A
External power supply on measurement switching	U & I	0	Depending on the power supply characteristics
External power supply 1 or 2 on Stimuli switching	U & I	0	Depending on the power supply characteristics

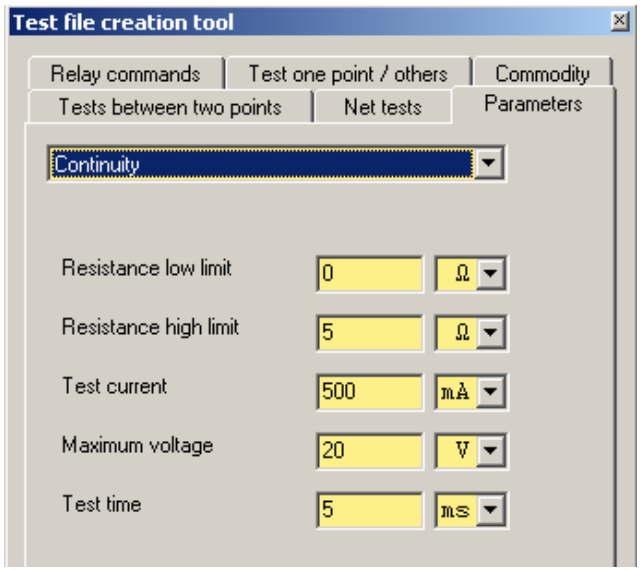
***Examples*:**

- From the **EDITOR** and using the test file writing tool

Insulation (PI)



Continuity (PC)

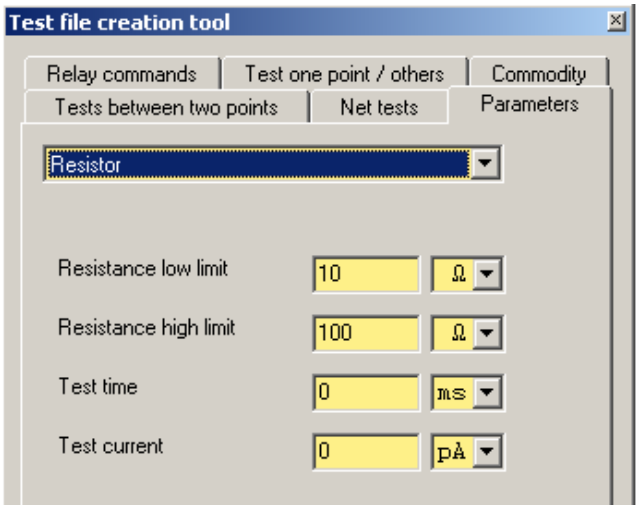


What shows up in the test program or in writing on the keyboard.

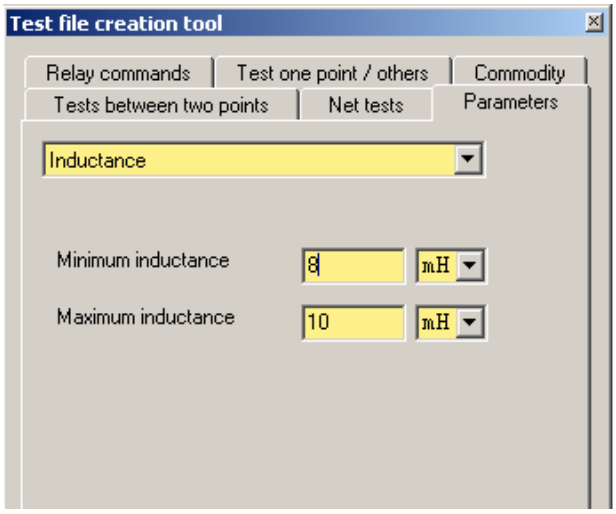
PI : VAL 100 M 500 1 m 10 m 30 m

PC : VAL 0 5 500 m 20 5 m

Resistance (PR)



Inductance (PLR)



What shows up in the test program.

PR : VAL 10 100 0 m 0 p

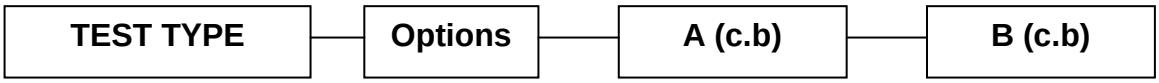
PLR : VAL 8 m 10 m

D.II.3.8 Test between two points

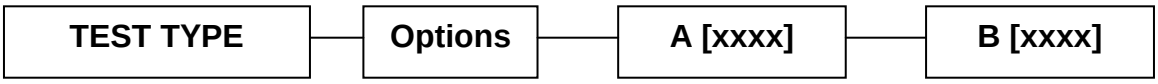
To carry out a test between 2 points, the application parameters must first be defined (see previous chapter). Once these parameters are entered, a test instruction needs defining that will apply these parameters and define the 2 points where the test will be applied.

a Programming syntax

Test points can be named in 2 different ways



Test written in **transcoded** points ("**c**" connector/ "**b**" pin). An equivalence table must be created beforehand.

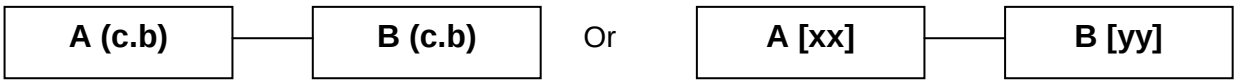


Test written in **machine points** (number of tester output terminals).

b Naming of points – Hot points, cold points

The hot points will always be **A** points, on which the positive voltages of the measurement will be applied. The **B** points are connected to the 0 V of the measurement.

There are two ways to reference a point:



- By putting the name given in the equivalence table *in* ***brackets*** (user point = transcoded point). The name is made up of a maximum of 24 characters (blanks, signs or letters).

It generally comprises: the connector and pin names.

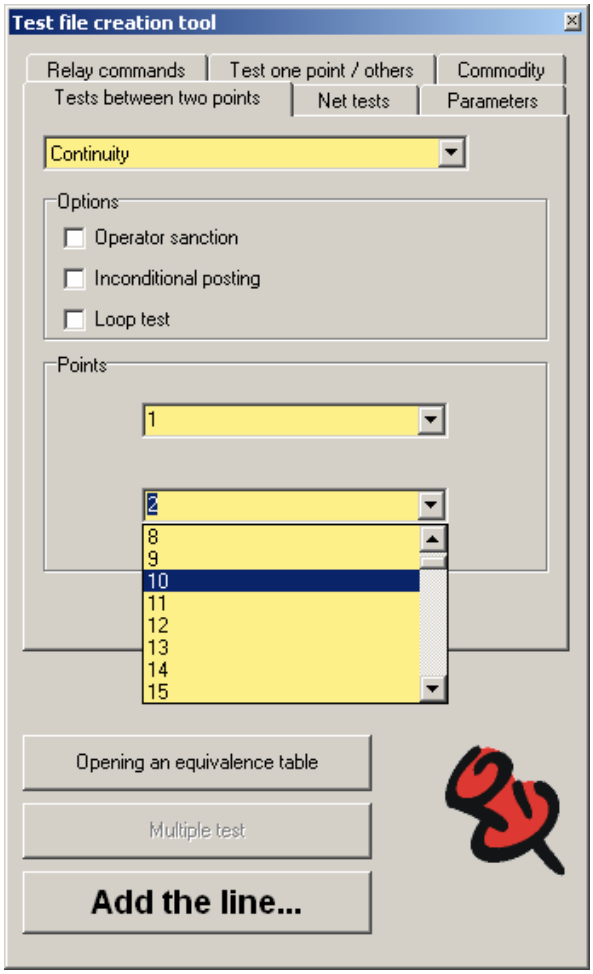
- By putting the number giving its address in machine points (tester output number) *in* ***square brackets***.

D.II.3.9 Type of test

There is a specific instruction for each type of test. There is a corresponding parameter associated with each test instruction.

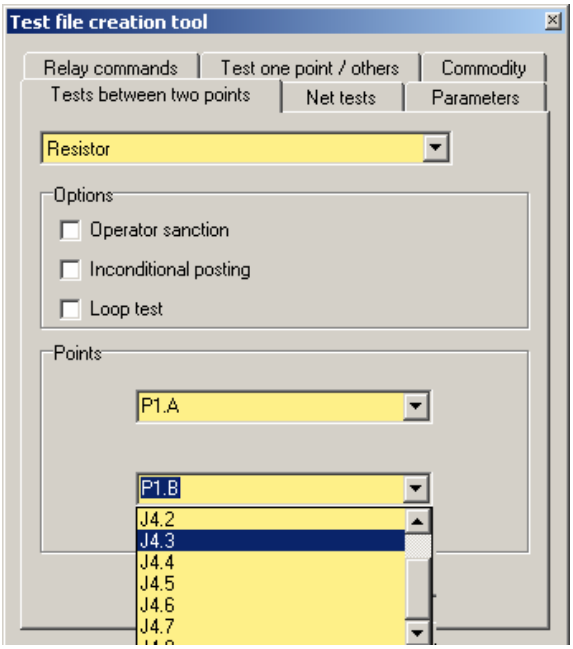
a Syntax

Example:



➢ From the **EDITOR,**

Here for a continuity or resistance measurement. To call up a equivalence table, simply select "open a equivalence table" and select the table you want. The points no longer show up in the tester address, but at the transcoded point. Select "Add the line" to write the corresponding instruction.



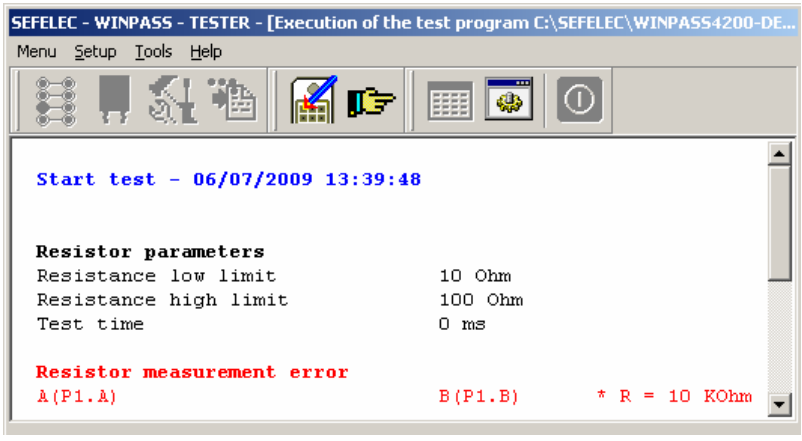
What shows up in the test file

PR : VAL 10 100 0 m 0 m

R A[1] B[2]

➢ From the **TESTER**

In the test results, the test parameters show up in black. The test results appear for each measurement, in blue if the result has passed and in red if the result has failed. In the event of a failed result, the measured value is shown in the test results.


SEFELEC - WINPASS - TESTER - [Execution of the test program C:\SEFELEC\WINPASS4200-DE...
Menu Setup Tools Help
Start test - 06/07/2009 13:39:48
Resistor parameters
Resistance low limit 10 Ohm
Resistance high limit 100 Ohm
Test time 0 ms
Resistor measurement error
A(P1.A) B(P1.B) * R = 10 KOhm

The different measurement instructions between two points (standard function of the tester)

Type of measurement	Measurement syntax
Continuous insulation	**I A(xx.yy) B(ww.zz)**
Continuity	**C A(xx.yy) B(ww.zz)**
Resistance	**R A(xx.yy) B(ww.zz)**
Capacitance	**F A(xx.yy) B(ww.zz)**
Shielding	**b A(xx.yy) B(ww.zz)**
4-wire continuity	**4 A(xx.yy) B(ww.zz)**
4-wire resistance	**R4 A(xx.yy) B(ww.zz)**
Diode	**d A(xx.yy) B(ww.zz)**
Zener diode	**dz A(xx.yy) B(ww.zz)**

The different measurement instructions between two points (tester option)

Type of measurement	Option required	Measurement syntax
dielectric strength AC	34019 (AC generator)	**J A(xx.yy) B(ww.zz)**
DC voltage	ZLC or 40535	**VC A(xx.yy) B(ww.zz)**
AC voltage	ZLC or 40535	**VA A(xx.yy) B(ww.zz)**
Inductance	ZLC	**LR A(xx.yy) B(ww.zz)**
Capacitance in alternating current	ZLC	**CR A(xx.yy) B(ww.zz)**
Inductor coil impedance	ZLC	**ZL A(xx.yy) B(ww.zz)**
Capacitive impedance	ZLC	**ZC A(xx.yy) B(ww.zz)**
GMOV	GMOV	**GM A(xx.yy) B(ww.zz)**
Voltage generation	U generation	**GU A(xx.yy) B(ww.zz)**
Current/voltage generation	U generation, card 40549	**u A(xx.yy) B(ww.zz)**
External power supply on measurement switching	U generation + external ps	**ue A(xx.yy) B(ww.zz)**
External power supply 1 or 2 on Stimuli switching	Stimuli with Microlab ps	**Us*n* ON or Us*n* OFF** *(n = 1 or 2)*

b Options

These are not compulsory and can be accumulated.

They are separated from the test code by a space.

O or S: **Operator decision**. Allows the operator to decide if the test has passed or failed.

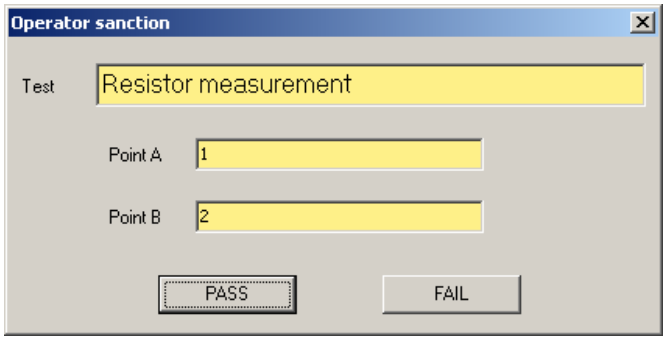
Example:

- From the **EDITOR**

```
PR : VAL  10  100  0 m  0 p
R  O  A[1]  B[2]
```

- From the **TESTER**.

A dialogue box appears. The operator can then select "PASSED" or "FAILED". In this case, the tester does not carry out any measurement. This is up to the operator, who will determine if the test has PASSED or FAILED.



W : **External output.** Allows 2 switching points to be routed on outputs located on the front panel. The operator can then carry out further measurements.

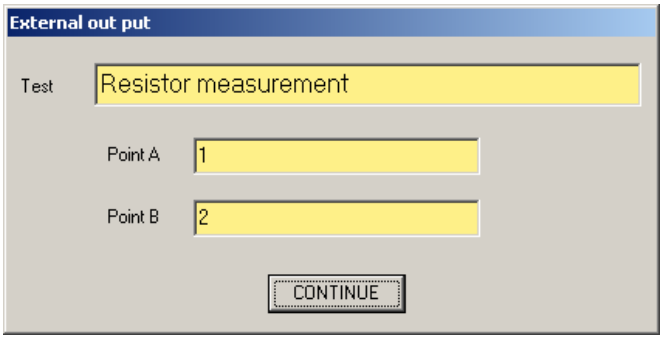
Example:

- From the **EDITOR**

```
PR : VAL  10  100  0 m  0 p
R  W  A[1]  B[2]
```

- From the **TESTER**.

A dialogue box appears, and the 2 switching points designated by the instruction are routed towards the "external output". The operator may carry out a verification measurement with an external appliance.



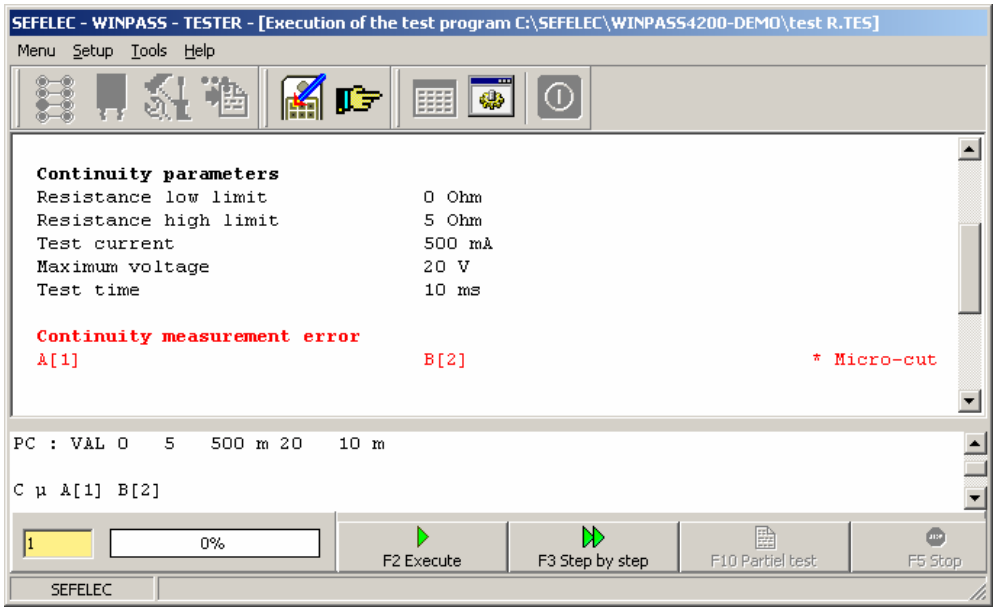
µ: **power line disturbance**. Only associated with a continuity test, detects power line disturbances during the test current application time.

Example:

- From the **EDITOR**

```
PC : VAL 0   5   500 m   20   5 m
C  µ  A[1]   B[2]
```

- From the **TESTER**


SEFELEC - WINPASS - TESTER - [Execution of the test program C:\SEFELEC\WINPASS4200-DEMO\test R.TES]
Menu Setup Tools Help
Continuity parameters
Resistance low limit 0 Ohm
Resistance high limit 5 Ohm
Test current 500 mA
Maximum voltage 20 V
Test time 10 ms
Continuity measurement error
A[1] B[2] * Micro-cut
PC : VAL 0 5 500 m 20 10 m
C µ A[1] B[2]
1
0%
F2 Execute
F3 Step by step
F10 Partiel test
F5 Stop
SEFELEC

I : **Display of the measured value**. Systematically shows the value of the size measured.

In the test setup (see corresponding chapter), it is possible to select “FULL EDITION”. In this case, all the test results are displayed. If this option is not active, only the fail tests will be displayed in the test results.

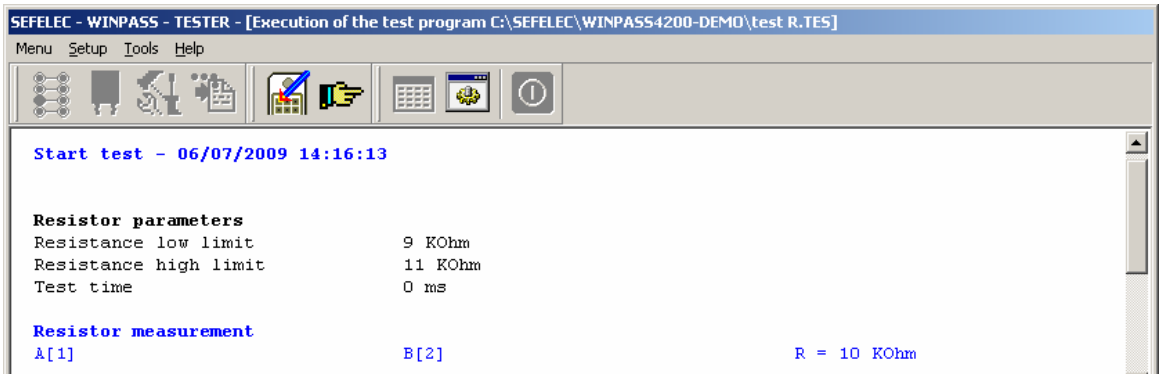
Example:

- From the **EDITOR**

```
PR : VAL  9 K  11 K  0 m  0 p
R  I  A[1]  B[2]
```

- From the **TESTER**.

Despite the tester being configured to display only the default test results, thanks to this option on the instruction, the results of this measurement are displayed in the test results.


SEFELEC - WINPASS - TESTER - [Execution of the test program C:\SEFELEC\WINPASS4200-DEMO\test R.TES]
Menu Setup Tools Help
Start test - 06/07/2009 14:16:13
Resistor parameters
Resistance low limit 9 KOhm
Resistance high limit 11 KOhm
Test time 0 ms
Resistor measurement
A[1] B[2] R = 10 KOhm

B: Run the test again.

Example:

- From the **EDITOR**

PR : VAL 9 K 11 K 0 m 0 p **R** B A[1] B[2]

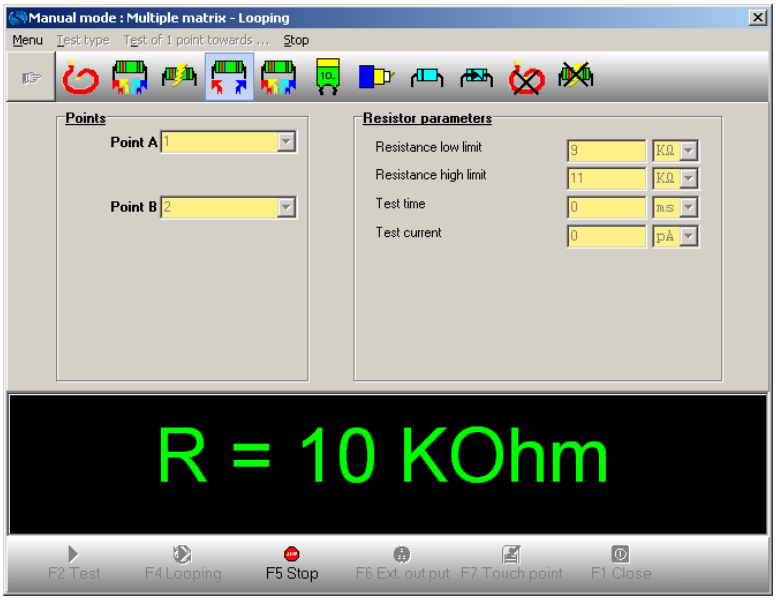
- From the **TESTER**

opens the manual mode window. The requested test is then rerun continuously.

The operator is required to press "STOP" to stop the measurement.

Pressing on "CLOSE" then resumes the test.

Only the result of the last measurement will be taken into account in the test results.



c Special case

Special case of resistance measurement

The setting of the resistance measurement can give rise to two possibilities:

- Test per range case

PR : VAL 990 1100 5 m 0µ
R A(P1.1) B(P3.8)

The resistance will pass if it lies between 990Ω and 1100Ω (possible values between 1 Ω and 10MΩ).

- Test from a threshold case

PR : VAL 990 **10 T** 5 m 0µ
R A(P1.1) B(P3.8)

The 10 TΩ value expresses a value above 10 MΩ, i.e. infinite. The value measured will pass if R > 990 Ω.

Special case for the slip rings

Instruction **4M** associated with parameter **P4**

Carries out a 4-wire resistance measurement for the time shown in parameter P4 and checks that the resistance values lie between the min. and max. values selected in parameter P4.

Option **DELTA** *value*

Inserted between P4 and 4M, checks during the 4M test that the delta between the maxR and minR measured is less than the value indicated in the DELTA instruction.

Example:
P4 : VAL 10 m 10 1 20 5
DELTA 500 m
4M [1] [3]

Checks during a 4-wire continuity measurement, between points 1 and 3, that the resistance values lie between 10mΩ and 10Ω, under a voltage of 20V 1A, for 5 seconds of test. The DELTA instruction checks in the measurement sampling that the difference between the max. and min. values measured is less than 500mΩ.

Special case for the capacitive element test

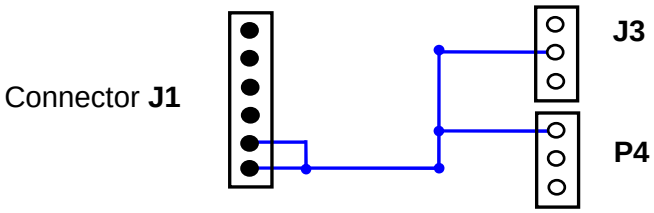
To measure the insulation between two points, the **I** test is used, associated with parameter **PI**. Should you wish to measure the insulation between two points connected by a capacitor, above 100 nF, the code **Ic** with the parameter **PI** must be used. In this case, the tester discharges the capacitor, measures the insulation and recharges the capacitor. The short-circuit is not measured.

NB: *This function is only active if the tester is equipped with a voltmeter (card 40535 or 40494).*

D.II.3.10 Net tests

A net is a series of wiring points with the same potential, and therefore connected by a wire (also called chain or shaft). An insulated point constitutes a net of 1 point for the tester.

Example of a net, here between 2 points of the "J1" connector and 1 point of the “J3” connector and 1 point of the “P4” connector.



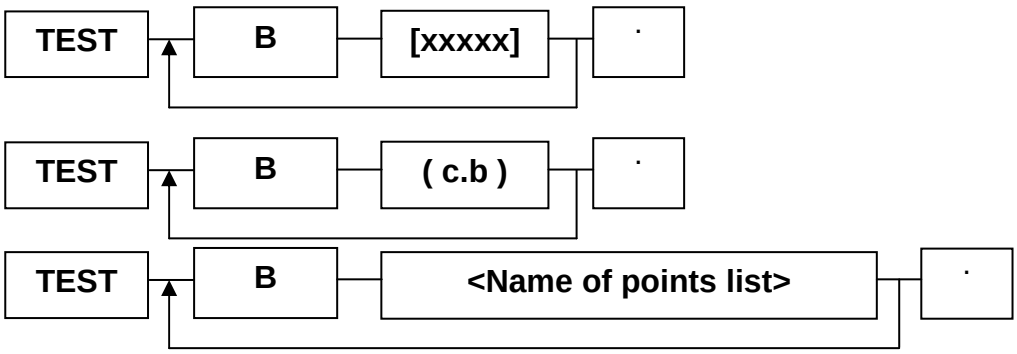
To test this net, you have to test its insulation (or non-continuity) with the other test points and the continuity between the net points.

On a net, the tester conducts:

1 – A global test between the lowest tester address point and all of the lower address points. This test is conducted at low voltage so as to detect short-circuits and at high voltage for breakdown or poor insulation.

2 – Continuity tests between the points described.

a Programming syntax



The number of points per net is unlimited. As stated above, the machine address points are in square brackets **[ ]** and the transcoded points in brackets **( )**.

In the latter case, the connector name is generally separated from the pin name by a separator: ., - or /

The description of a net always ends with a “.”.

b Naming of points

1 – Programming in tester points, it is possible to give as many B points [ ] as there are tester points.

2 – Programming in user points (from an equivalence table), it is possible to give as many B points ( ) as tester points.

3 – Programming in list of points: a list of points gathers together all of the points of a net. Only the name of this list between < and > is to be given in the programming.

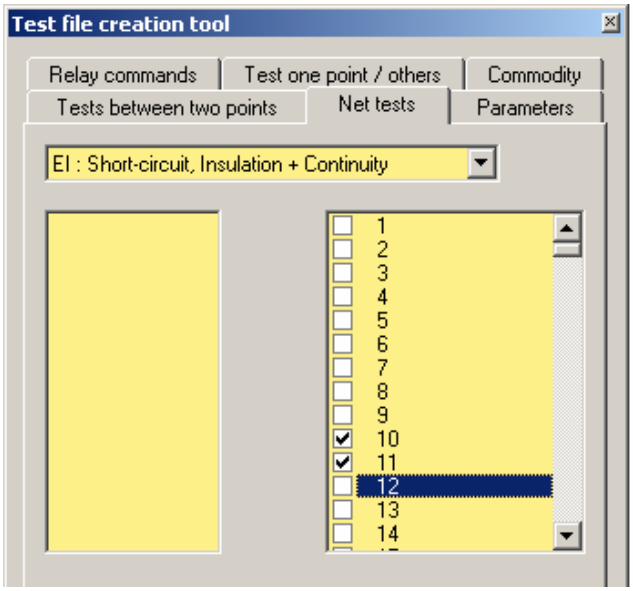
Example: EI B<equipo1> B<equipo2> .

c Type of test

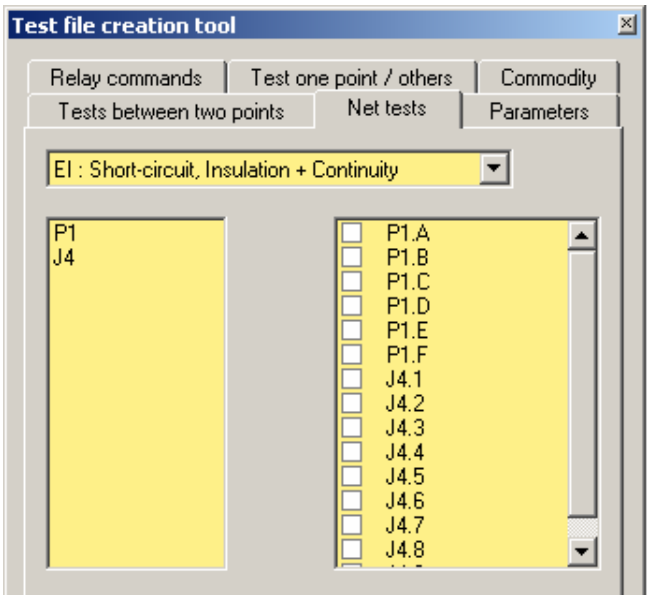
Example of programming a net

With the test fible creation tool

Writing from tester points



Writing from user points



To call up a equivalence table, simply select "open an equivalence table" in the writing tool and select the table you want. The points no longer show up in the tester address, but at the transcoded point. Select "Add the line" to write the corresponding instruction.

What shows up in the test program

PI : VAL 100 M 500 1 m 10 m 30 m

PC : VAL 0 5 500 m 20 5 m

EI B(J1.5) B(J1.6) B(J3.2) B(P4.1) .

EI B[10] B[11] .

What the global test involves

In all the following cases, the continuity test(s) between the net points is (are) executed.

To summarise:

EI Tests: short-circuit + DC dielectric + insulation + continuity between the points. Insulation and continuity parameters (PI and PC) required.

EId Tests: short-circuit + DC dielectric + continuity between the points. Insulation and continuity parameters (Pld and PC) required.

EJ Tests: short-circuit + AC dielectric + continuity between the points. Rigidity and continuity parameters (PJ and PC) required.

EN No insulation or short-circuit test at the start of the net. Only the continuity test is carried out. A continuity parameter is required. (PC).

ED Short-circuit + continuity tests between the points. Continuity parameters (PC) required.

II DC dielectric + insulation + continuity tests between the points. Insulation parameters (PI) required.

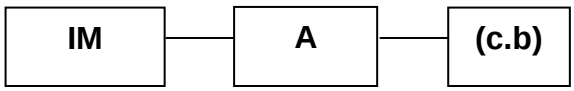
IJ AC dielectric + continuity tests between the points. Rigidity parameters (PJ) required.

Two parameters are necessary for a net: PI for the net insulation and PC for the continuity of the net points and the short-circuit test.

D.II.3.11 Multiple tests of one point in relation with the others

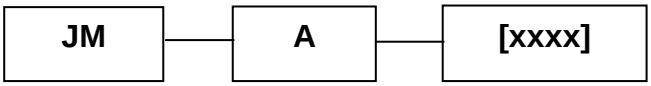
A global test puts the point to be tested in the “hot point” of the measurement and all the other points at 0V of the measurement. A low-voltage test is carried out to detect the short-circuits and then a high-voltage test for breakdowns or poor insulation.

Test of one point in relation with the others, in DC



The PI and PC parameters are required. This programming can be done in tester points but not in a list of points.

Test of one point in relation with the others, in AC



The PJ and PC parameters are required. This programming can be done in tester points but not in a list of points.

IM Tests: short-circuit + DC dielectric + insulation. Insulation and continuity parameters (PI and PC) required.

JM Tests: short-circuit + AC dielectric. Insulation and continuity parameters (PJ and PC) required.

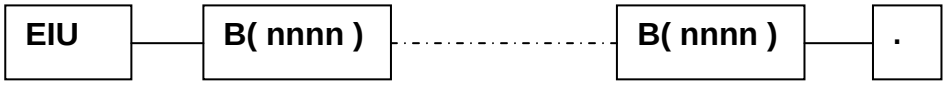
D.II.3.12 Multiple tests for unitary relay testers

Net test in relation to all the other points

On a net, the tester conducts:

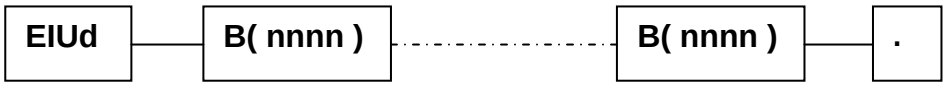
1 – A global test between the points described by the B points, which will be connected to the hot point of the tester, and all the other points, which will be connected to the cold point of the tester. This test is initially conducted at low voltage so as to detect short-circuits and then at high voltage for breakdown or poor insulation.

2 – Continuity tests between the points described.



The net test, with unitary relays, connects the B points described to the hot point of the measurement and carries out the insulation test with all the other points, not described, at 0V.

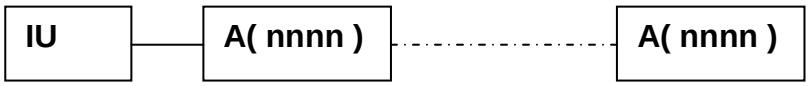
Then the continuity test between the **B** points is carried out, like with the **EI** code.



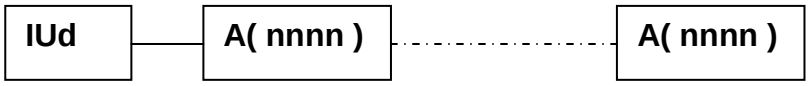
This test, associated with the Pld parameter, does not carry out an insulation test (only DC rigidity).

To replace the DC rigidity test with an AC rigidity test, the code **J** replaces **I**.

Insulation test between the A points described and all the other points

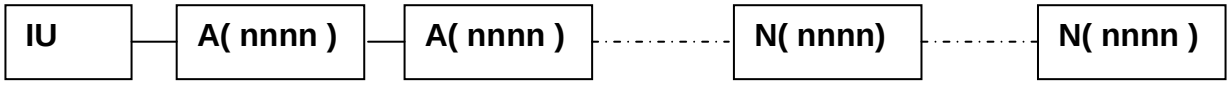


Any number of A points can be described by their address. They will be connected to the hot point of the measurement. All other non-described points will, without exception, be connected to the 0 V of the measurement. There is no continuity test between A points as these points are part of a group and not a net. In AC, the code **J** replaces **I**.

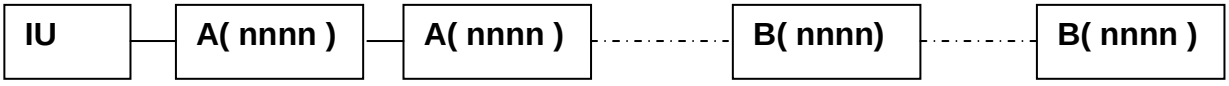


This test, associated with the Pld parameter, does not carry out an insulation test (only DC rigidity).

Insulation or AC dielectric test between the A and B points described

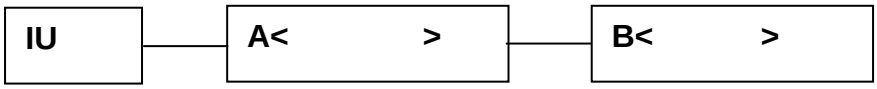


The A points will be connected to the hot point, the points indicated by the code N will be floating points. The other points will be connected to the cold point.



In this case the A points described are connected to the hot point of the measurement and only the B points described are connected to the 0 V of the measurement. The non-described points are floating points.

There is no continuity test between A points or B points as these points are part of two groups and not nets.



The test conditions are identical except that the point addresses are replaced by the defined group names.

If you wish to run the same tests for alternating current (AC dielectric option), simply replace the letter **I** with **J**.

Example:

- From the **EDITOR**

PI : VAL 100 M 500 1 m 10 m 30 m

PC : VAL 0 5 500 m 20 5 m

IU A[1] A[2] A[10] B[4] B[9] B[64].

Group test in a STIMULI zone

In a zone demarcated by **STIMULI** and **FSTIMULI**, net tests must not be carried out as they may short-circuit the command power supplies with the lower points. This is the case of EI tests or the "other points" in the case of IU or IM tests.

However, **IU** can be used if B points are described.

Ex : IU A(P1.1) A(P2.1) B(TB1.5) **.**

If the points called are known, short-circuits of the stimuli power supplies are less probable. However, you are recommended, as far as possible, to run a complete wiring test of these points before any stimulus command.

To summarise:

EIU Tests: short-circuit + DC dielectric + insulation + continuity between the points. Insulation and continuity parameters (PI and PC) required.

EIUd Tests: short-circuit + DC dielectric + continuity between the points. Rigidity and continuity parameters (Pld and PC) required.

EJU Tests: short-circuit + AC dielectric + continuity between the points. Rigidity and continuity parameters (PJ and PC) required.

IU Tests: short-circuit + DC dielectric + insulation. Insulation and continuity parameters (PI and PC) required.

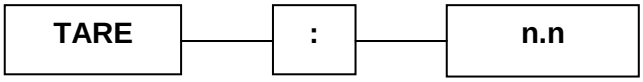
IUd Tests: short-circuit + DC dielectric. Rigidity and continuity parameters (Pld and PC) required.

JU Tests: short-circuit + AC dielectric. Insulation and continuity parameters (PJ and PC) required.

D.II.3.13 TARE function

In order to get away from interface and tooling resistance, it is possible to programme a TARE so that the tester takes this value away at each 2-wire continuity or resistance measurement.

This function can be introduced several times in the test file. It is valid for all the tests that follow.



The values will be given in ohms and tenth ohms.

Example:

- From the **EDITOR**

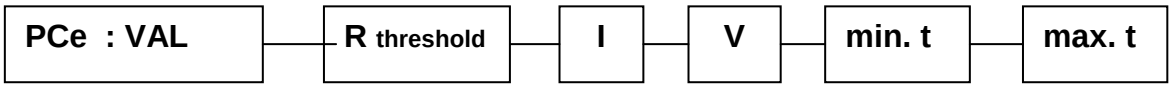
```
PI : VAL  100 M  500   1 m  10 m  30 m
PC : VAL  0   5   500 m   20   5 m
PR : VAL  4   6   10 m   0 m

EI  B[1  B[2]  B[4].
TARE : 5
R  A[5]  B[6]
TARE : 0
R  A[7]  B[8]
```

D.II.3.14 Event wait (contact state)

The following instructions should be followed to detect the moment of contact closing or opening.

Parameters



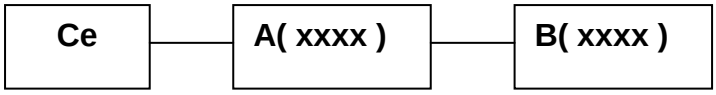
The measurement used is continuity. A generator current and voltage must therefore be entered.

If the test is PASSED, the tester moves automatically to the next measurement. If the test is failed, in the event that the contact never closes for example, the message "no event" appears.

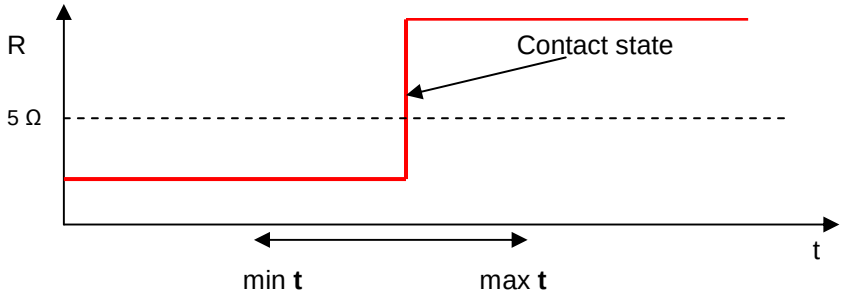
Limit of event wait parameters (contact state)

Parameter	Min. value	Max. value
R Threshold	0	250 Ω
I	10 mA	2 A
V	5 V	20 V
time	0	1000 s

a Waiting for contact opening:



At the start of the test, the contact is made. The tester will wait for the measured resistance to be greater than the "**R** threshold". For the test to PASS, this event must occur between "min. **t**" and "max. **t**".



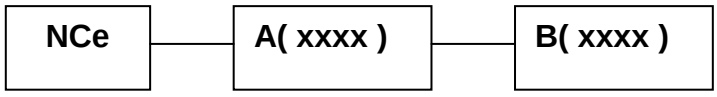
Example: The diagram above must be programmed as follows:

PCe: VAL 5 500 m 20 1 5

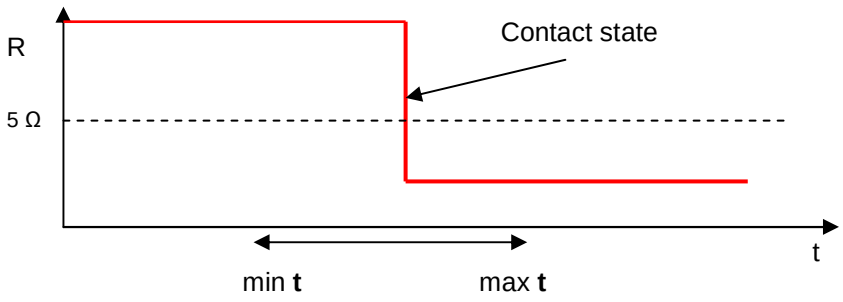
Ce A(P1.2) B(P5.12)

The event is correct if the contact opens (R > 5Ω) within 1 to 5 seconds. The chosen current is 500 mA and the generator is limited to 20 V.

b Waiting for contact closing:



At the start of the test, the contact is not made. The tester will wait for the measured resistance to be smaller than the "**R** threshold". For the test to PASS, this event must occur between "min. **t**" and "max. **t**".



Example: the diagram above must be programmed as follows:

PCe: VAL 5 500 m 20 1 5

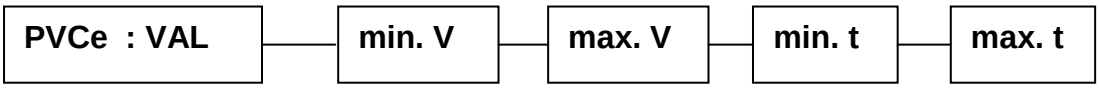
NCe A(P1.2) B(P5.12)

The event is correct if the contact closes (R < 5Ω) within 1 to 5 seconds. The chosen current is 500 mA and the generator is limited to 20 V.

D.II.3.15 Event wait (voltage state)

The following instructions should be followed to detect the moment when a voltage appears or disappears.

Parameters



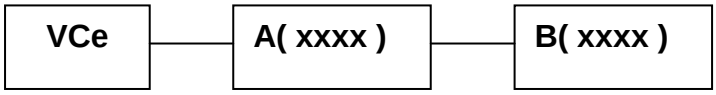
The measurement is the DC voltage measurement. A voltage range for the voltmeter must therefore be entered.

If the test is PASSED, the tester moves automatically to the next measurement. If the test is failed, for example, if there is never any voltage, the message "no event" appears.

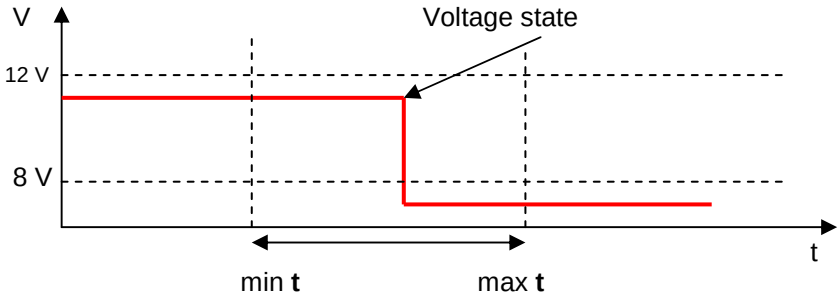
Limit of event wait parameters (voltage state)

Parameter	Min. value	Max. value
V	0	500 V
time	0	1000 s

a Waiting for a voltage drop:



At the start of the test, a voltage is present. The tester will wait for the measured resistance to be smaller than the “min. **V**”. For the test to PASS, this event must occur between “min. **t**” and “max. **t**”.



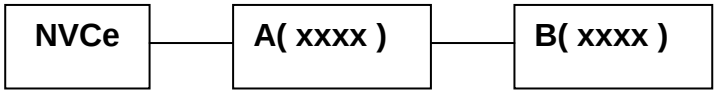
Example: the diagram above must be programmed as follows:

PVCe : VAL 12 8 1 5

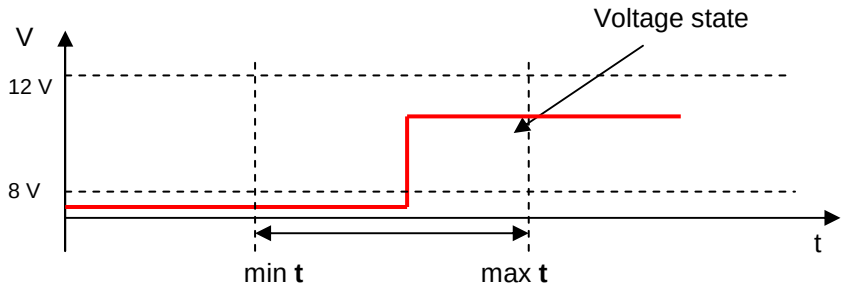
VCe A(P1.2) B(P5.12)

The event is correct if the voltage drops below 8 V within 1 to 5 seconds.

b Waiting for a voltage to appear



At the start of the test there is no voltage between A and B. The tester will wait until it reaches a value above the minimum threshold "min. **V**". For a PASSED result, this event must occur between "min **t**" and "max **t**".



Example: the diagram above must be programmed as follows:

PVCe : VAL 12 8 1 5

NVCe A(P1.2) B(P5.12)

The event is correct if the voltage rises to between 8 and 12 V, within 1 to 5 seconds.

The programming of 0 V for min. V must be based on a threshold (max. V).

Attention: residual voltage is always present in an unloaded electromagnetic circuit. 0 V must be programmed after running tests (manual mode).

D.II.3.16 Displacement

DEP	:	Displacement value

The displacement (numerical) value is added to all the points that follow in the equivalence table. It is used to test the same equipment in another zone of the switching matrix. A new displacement value cancels out the previous one.

It is possible to open a dialogue box asking the operator the desired shift. In this case the following instruction must be used:

DEP	:	?

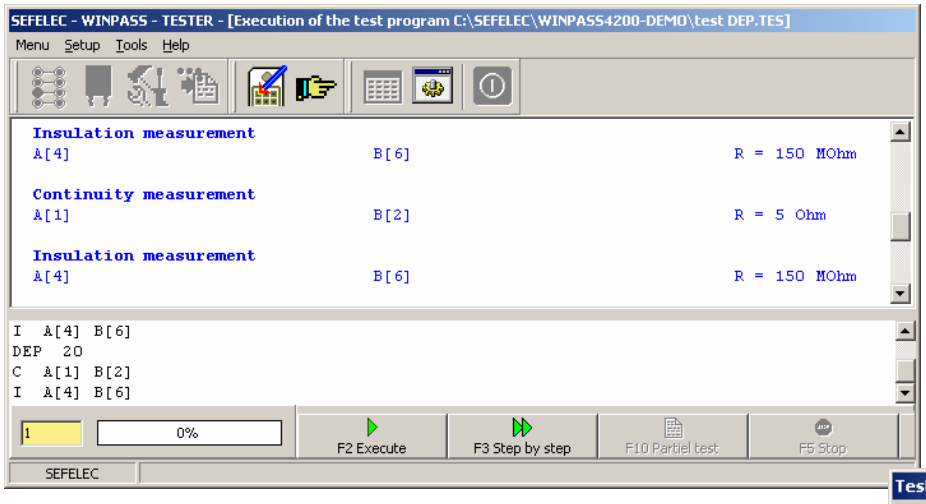
The dialogue box asks for the shift of tester points that will have to be taken into account. The number of switching points of the tester is indicated to inform the operator of the number that cannot be displaced.

Example:

- From the **EDITOR**, an initial electrical test will be carried out between points 1 and 2. Following the "DEP: 20" instruction, the following test will not be carried out between points 1 and 2, but 21 and 22.

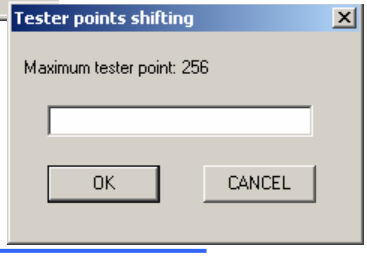
```
C  A[1]  B[2]
I   A[4]  B[6]
DEP  20
C  A[1]  B[2]
I   A[4]  B[6]
```

- From the **TESTER:**



While the program is being executed, no information is provided during the test to say that the equivalence table has been shifted by the number of points given by the DEP instruction.

If the "DEP?" use was used, a dialogue box opens asking the operator for the shift value required.



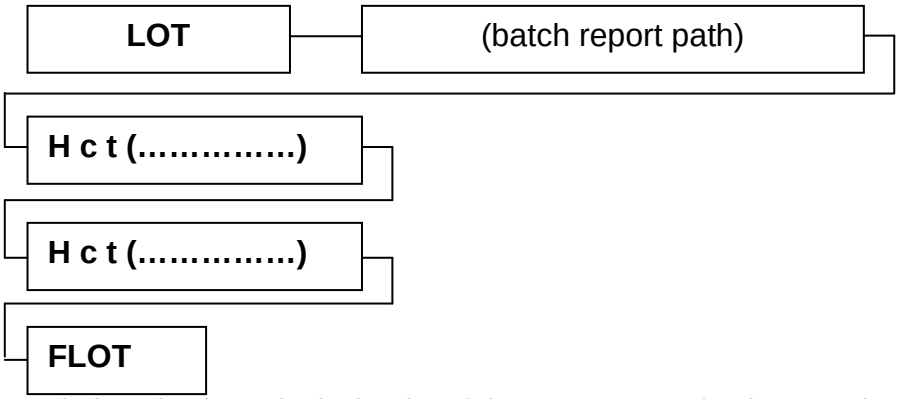
D.II.3.17 Batch management

Batch management occurs when testing several identical parts and wanting one report of all the parts together, rather than one report per part.

a Batch function : LOT

If the BATCH function is introduced in the test file, a result report common to all the products in a batch can be produced. This function does not hide the test results for each part tested.

The BATCH function is placed after the different electrical tests intended to test the part making up the BATCH. The instructions between BATCH and FLOT are intended solely for the layout of the BATCH report.



The test is carried out in chronological order of the test program implemented.

When the BATCH zone is executed, dialogue boxes successively ask:

- for the BATCH number
- If the part is to be counted. Answer YES to add the part for this batch number, or NO to ignore this part for this batch number.
- If the BATCH is complete. Answer Yes for a BATCH result file to be created, called “BATCH + test file name + BATCH no.”. This file is formatted according to the texts written between BATCH and FLOT. Answer NO for the BATCH to be completed at another time.
- The end of test dialogue box “TEST PASSED or FAILED” appears and suggests RETESTING or STOPPING.

It is possible to reopen a BATCH by running the program and recalling the same BATCH number.

It is possible to reopen a stopped batch for which a batch report has already been created. For example, if the operator has validated the batch end, but would like to add parts later on, all he has to do is recall the number. In this case, the BATCH result file will be erased and replaced by the updated BATCH file.

The BATCH report is formatted by the TEXT “H c n (….)” instructions between the BATCH and FLOT zone. Variables may be associated: see the “variables” chapter below.

This file is saved in the directory specified by the batch report path, e.g. C:\sefelec\lot.

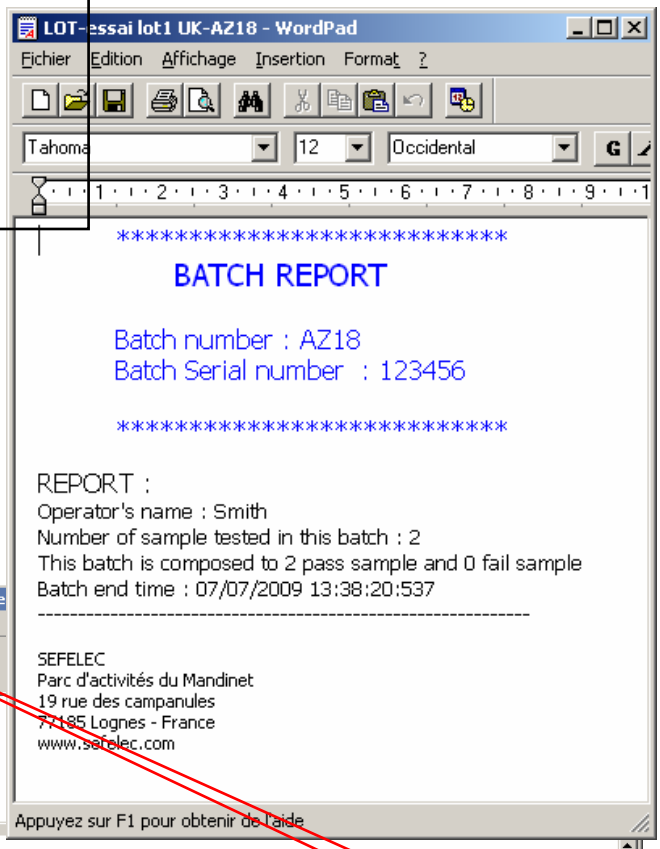
The batch name is given in alphanumerical characters (32 maximum) but "**.**" (full stop) and "****" (anti-slash) must not be used.

You can open this BATCH report from WORD or WORDPAD.

***Example**:*

- From the **EDITOR**

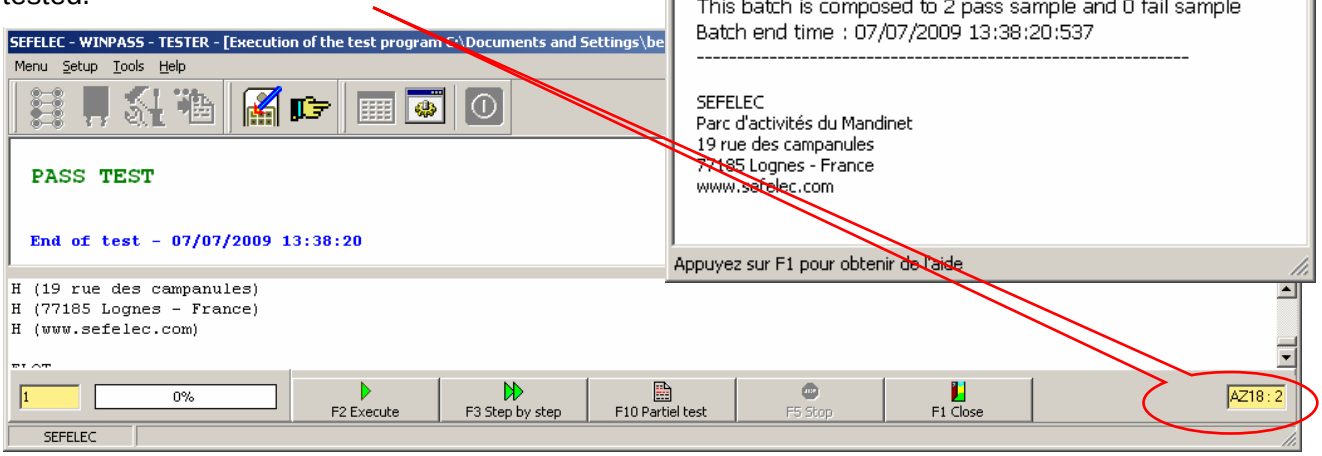
```
LOT (C:\sefelec\lot)
H B 14 ( ***************************)
H B 16 (       BATCH REPORT)
H B 14()
H B 14 ( Batch number : &LOT1)
H B 14 ( Batch Serial number : &DIAL2)
H B 14 ( ***************************)
H ()
H N 14 (REPORT :)
H N 12 (Operatir's name : &DIAL1)
H N 12 (Number of sample tested in this batch : &LOT2)
H N 12 (This batch is composed to &LOT3 pass sample and
&LOT4 fail sample)
H N 12 (Batch end time : &DATE)
H N 12 (------------------------------------------------------------)
H ()
H (SEFELEC)
H (Parc d'activités du Mandinet)
H (19 rue des campanules)
H (77185 Lognes - France)
H (www.sefelec.com)
FLOT
```


LOT-essai lot1 UK-AZ18 - WordPad
Fichier Edition Affichage Insertion Format ?
Tahoma 12 Occidental
****
BATCH REPORT
Batch number : AZ18
Batch Serial number : 123456
****
REPORT :
Operator's name : Smith
Number of sample tested in this batch : 2
This batch is composed to 2 pass sample and 0 fail sample
Batch end time : 07/07/2009 13:38:20:537
SEFELEC
Parc d'activités du Mandinet
19 rue des campanules
77185 Lognes - France
www.sefelec.com
Appuyez sur F1 pour obtenir de l'aide

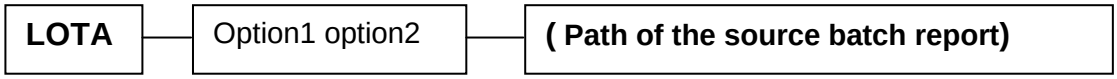
- From the **TESTER**

once the tests have been carried out, the batch report file will be saved automatically.

A <u>counter at the bottom left of the screen</u> indicates the batch name and number of parts tested.



b Batch function : LOTA



A / The different LOTA options

The following options are programmable with the following combinations:

LOTA B Only counts good parts, a batch may not be completed or reopened

LOTA B C Only counts good parts, a batch may be completed

LOTA B R Only counts good parts, a batch may be completed or reopened

LOTA T Counts all parts, a batch may not be completed or reopened

LOTA T C Counts all parts, a batch may be completed

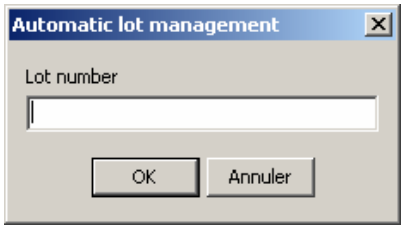
LOTA T R Counts all parts, a batch may be completed or reopened

Complete means a batch that has not been closed, and the batch report not published as the number of parts desired has not been obtained. It is possible to complete this batch until the number of desired parts is obtained. Once the batch is completed and the batch report published, it is no longer possible to modify or reopen it.

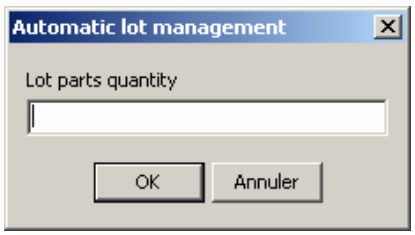
Reopen means a BATCH that has been closed, and you want to add more parts to it. In this case, a new BATCH report will be published under the same name as the old one. The previous batch report will be erased.

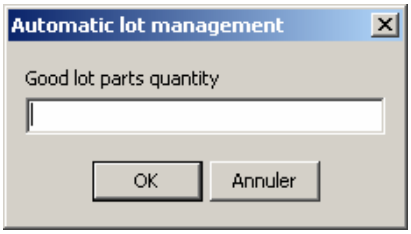
B / Running the program with LOTA

When the LOTA function is present in a program, the TESTER will ask what the BATCH number is when the program starts up (irrespective of the LOTA position in the program). These dialogue boxes will be the first instructions asked during the test.



Then either the number of good parts of the BATCH will be asked (in the event of the LOTA B function) or the number of parts in the BATCH (in the event of the LOTA T function).

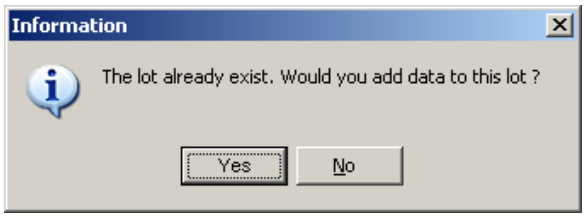




Then the program will be run in chronological order. The program may be executed several times, and when the number of parts is obtained (either the number of good parts or the number of total parts), then the BATCH report will be generated and closed.

C / Reopening or completing a LOTA

To reopen or complete a batch, launch the program and when the batch number is requested, simply enter the number of the batch that has already been tested and a dialogue box will ask if you want to complete this BATCH.



You will then be asked the number of BATCH parts. This number is the number of parts to be added to the previously tested batch.

If this dialogue box appears, it means that you are using an existing batch number, and that the option to reopen or complete a BATCH has not been selected in the program. You will not therefore be able to complete this batch.

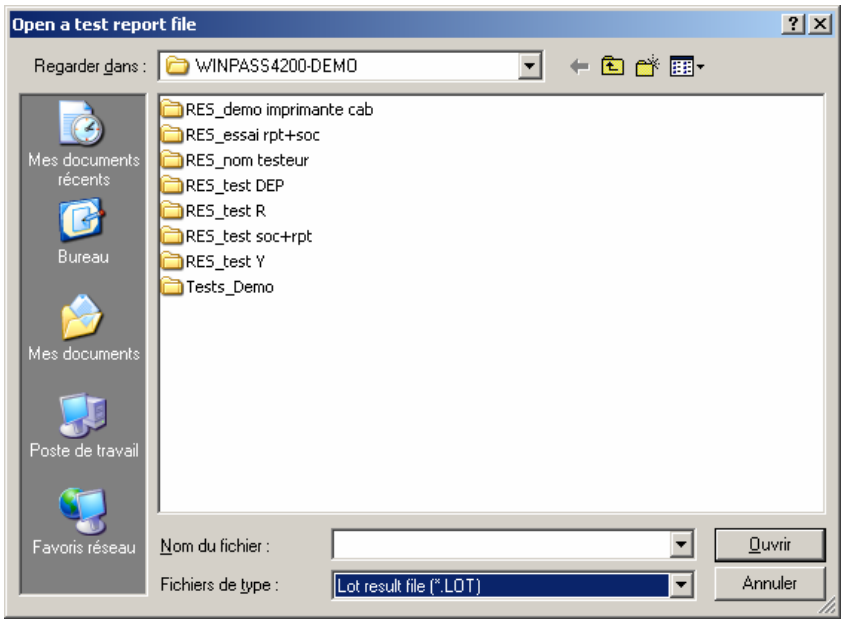
D / LOTA report

When the BATCH has reached the number of parts defined, the batch report is generated (this number is defined by the number entered in the dialogue box).

The LOTA report is created from a source file in html format. See the chapter below on the test report function for creating the source file. In this file, customer-specific layout may be carried out with the addition of test variables. The test variable fields will be replaced in the BATCH report by their respective values during tests.

The directory where this report is created is the same as the source report.

The batch report is saved under the name “source file name + batch no.”. This file is an html format. You can open it from TESTER/MENU/OPEN a results file or from an html editor.



The batch report name is given in alphanumerical characters (32 maximum) but "**.**" (full stop) and "\" (anti-slash) must not be used.

D.II.3.18 Test result in the form of an EXCEL file

The test result can be obtained in the form of an EXCEL® file.

This file only processes the code LABEL if the test has to be divided into chapters. Texts H c t ( ) are not taken into account.

Only tests appearing in the test result on the screen are copied into the EXCEL table. A column indicates PASS or FAIL for the test of each line. The *.XLS file is stored in the directory RES_xxxx of the test file. The "total printout" function copies all the measurements into the table.

Label	Type of test	Point A	Point B	Measurement	Passed (P) Failed (F)	Value
Part One	Insulation Measurement	P1.A		R > 150 MOhms	P	150000000
	Continuity Measurement	P1.A	P1.C	R = 5 Ohms	P	5
Part One	Insulation Measurement	P1.D		R > 150 MOhms	P	150000000
Part One	Insulation Measurement	P1.E		R > 150 MOhms	P	150000000
	Continuity Measurement	P1.E	J4.2	R = 5 Ohms	P	5
	Continuity Measurement	P1.E	J4.7	R = 5 Ohms	P	5
	Continuity Measurement	P1.E	J4.9	R = 5 Ohms	P	5
Part One	Insulation Measurement	P1.F		R > 150 MOhms	P	150000000
	Def. Continuity Measurement	P1.F	J4.5	* R = 5 Ohms	F	5
Part One	Insulation Measurement	J4.5		R > 150 MOhms	P	150000000

The function is implemented by selecting the option in the results save configuration.

The Excel report is not a test instruction. It is a configuration option that can be accessed from the WINPASS Tester menu “test setup”

D.II.3.19 Test report function

The test report instruction calls up a prepared test report file in which texts, images, logos or variables from the test results file can be added. This format, defined by the user, creates a summary of the tests carried out by the tester.

CRT	Source file path	Target file path

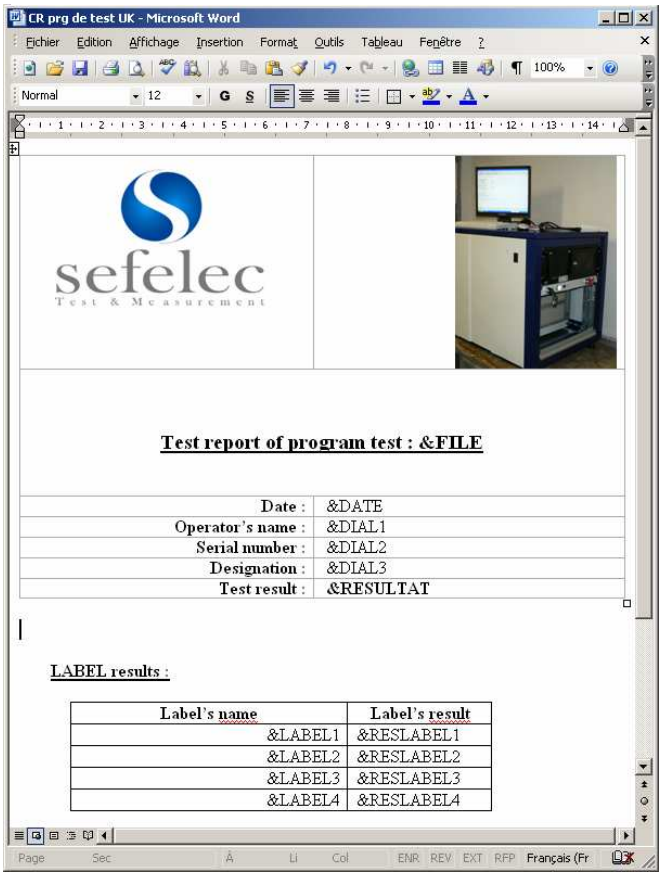
The source file will contain the basic report in HTML form (images, text logos or tables) or TEXT form. The target file will be managed as a results file. Both files can be stored in the same directory but they must have different names. In the source target file name of the test report, it is possible to include the different variables described in the chapter “Test variables”.

Example:

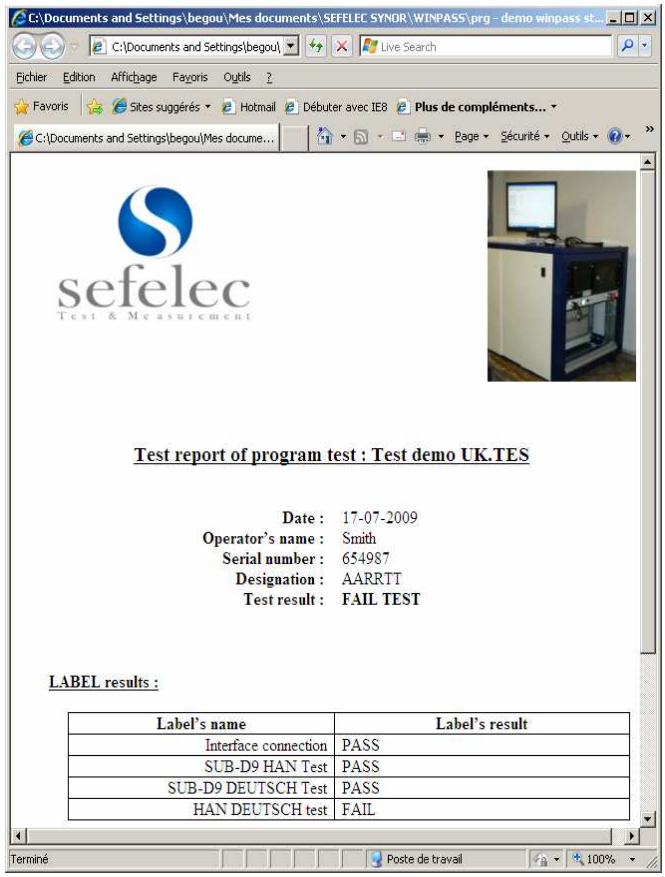
- From the **EDITOR**

CRT (C:\WINPASS\CR de test.htm) (C:\WINPASS\CR_&DIAL1_&DIAL2.htm)

Example of source file



target file created by the WinPass **TESTER**



D.II.3.20 Test variables

When using the test report function or “LOTA” “BATCH” function, or from “H” test display instructions, it is possible to call up the list of variables below:

System variable

&DIALn returns the field of row n of the dialogue box

&DATE returns the date given by the PC

System variable (only with the test report function “CRT”)

&LABELn returns the name of the LABEL of row n

&FILE returns the name of the test file

&RESULTAT returns the FAIL or PASS result for the final test

&RESLABELn returns the result of LABEL number n

Test between two points (only with the test report function)

The variables described below return either the test number carried out or the number of test faults described by the code between the two _ (see list of test commands)

Example: &RS_R_ returns the number of resistance tests carried out from the “R” programming code and &RS_RDEF_ returns the number of defective resistance tests.

&RS_I_	**&RS_d_**	**&RS_GM_**
&RS_IDEF_	**&RS_dDEF_**	**&RS_GMDEF_**
&RS_NI_	**&RS_dz_**	**&RS_VC_**
&RS_NIDEF_	**&RS_dzDEF_**	**&RS_VCDEF_**
&RS_J_	**&RS_F_**	**&RS_VA_**
&RS_JDEF_	**&RS_FDEF_**	**&RS_VADEF_**
&RS_C_	**&RS_b_**	**&RS_THTC_**
&RS_CDEF_	**&RS_bDEF_**	**&RS_THTCDEF_**
&RS_NC_	**&RS_LR_**	**&RS_THTA_**
&RS_NCDEF_	**&RS_LRDEF_**	**&RS_THTADEF_**
&RS_4_	**&RS_CR_**	**&RS_GU_**
&RS_4DEF_	**&RS_CRDEF_**	**&RS_GUDEF_**
&RS_R_	**&RS_ZL_**	**&RS_u_**
&RS_RDEF_	**&RS_ZLDEF_**	**&RS_uDEF_**
&RS_R4_	**&RS_ZC_**	**&RS_ue_**
&RS_R4DEF_	**&RS_ZCDEF_**	**&RS_ueDEF_**

Net test (only with the test report function)

&RS_EQUI_ returns the number of nets

&RS_EQUIDEF_ returns the number of defective nets

&RS_EQUICC_ returns the number of short-circuit tested nets

&RS_EQUICCDEF_ returns the number of defective short-circuit tested nets

&RS_EQUII_ returns the number of insulation tested nets

&RS_EQUIIDEF_ returns the number of defective insulation tested nets

&RS_EQUIJ_ returns the number of AC dielectric tested nets

&RS_EQUIJDEF_ returns the number of defective AC dielectric tested nets

&RS_EQUIC_ returns the number of DC net points

&RS_EQUICDEF_ returns the number of defective DC net points

D.II.3.21 Test variables specific to the BATCH

The variables that can be used from the BATCH function are described below. All the other variables described previously are still valid.

Batch name: **&LOT1**

Total number of parts: **&LOT2**

Number of good parts: **&LOT3**

Number of bad parts: **&LOT4**

Enter the batch end time: **&HEURE**

Enter the operator name (used when opening a WINDOWS session): **&OPE**

The following variables are only valid with the LOTA function

Recopy the test parameters clearly: **&Px_n** gives the value of field n in the Px parameter used during the test.

PI : VAL 100 M 500 1 m 10 m 30 m

Example: **&PI_2** will be replaced with **500V, &P-1** will be replaced with 100MΩ

&PI_1, &PI_2, &PI_3, &PI_4, &PI_5	&PVA_1, &PVA_2
&PC_1, &PC_2, &PC_3, &PC_4, &PC_5	&PJ_1, &PJ_2, &PJ_3, &PJ_4,
&PTHTC_1, &PTHTC_2, &PTHTC_3, &PTHTC_4, &PTHTC_5	&PTHTA_1, &PTHTA_2, &PTHTA_3, &PTHTA_4, &PTHTA_5
&P4_1, &P4_2, &P4_3, &P4_4, &P4_5	&PGU_1
&PR_1, &PR_2, &PR_3, &PR_4	&Pu_1, &Pu_2
&PR4_1, &PR4_2, &PR4_3	&Pue_1, &Pue_2
&Pd_1, &Pd_2, &Pd_3	&PCe_1, &Pce_2, &PCe_3, &PCe_4, &PCe_5
&Pdz_1, &Pdz_2, &Pdz_3	&PVCe_1, &PVCe_2, &PVCe_3, &PVCe_4
&PF_1, &PF_2	&PMVDC_1, &PMVDC_2
&Pb_1, &Pb_2	&PMVAC_1, &PMVAC_2
&PLR_1, &PLR_2	&PMIDC_1, &PMIDC_2
&PCR_1, &PCR_2	&PMR_1, &PMR_2
&PZL_1, &PZL_2	&PMR4_1, &PMR4_2
&PZC_1, &PZC_2	&PMP_1, &PMP_2
&PGM_1, &PGM_2, &PGM_3, &PGM_4, &PGM_5	&PMVDC_I_1, &PMVDC_I_2, &PMVDC_I_3
&PVC_1, &PVC_2	&PMVAC_I_1, &PMVAC_I_2, &PMVAC_I_3
&Pus1_1, &Pus1_2	&PM1500P_1, &PM1500P_2, &PM1500P_3
&Pus2_1, &Pus2_2	&PS_1, &PS_2, &PS_3

D.II.4 SYNTAX OF SPECIFIC TESTS

A list of specific instructions for certain applications is given below

D.II.4.1 COMPARE function

Following two measurement tests between two points, it is possible to compare these values and display the result of this comparison in the test report. The different parameters to be specified during the call up of this function are:

the type of measurement to compare (R, C, d, F;.. etc.)

the comparator (= , > ; < ; <> ; >= ; <=)

the tolerance value as a percentage (between 0.0001 and 100).

Example:

R A[8] B[9]

R A[12] B[15]

COMPARE (R , <= , 2)

The programme will therefore test that the resistance value between points 8-9 is less than or equal to the resistance between points 12-15, by around 2%.

D.II.4.2 Charge/Discharge

It is possible to validate or stop the discharge function of the tester systematically from the DISCHARGE ON or DISCHARGE OFF command. Or it is possible to force a discharge between two points only, and to indicate the desired discharge time. In this case, in addition to the two points to be discharged, the discharge time must also be given in ms. Discharges are done via resistances of 1kΩ.

Example:

DECHARGE OFF from this command after each measurement test, there will be no discharge of these points.

R A(2) B(4)

R A(3) B(5)

DECHARGE A(3) B(5) 10 points 3 and 5 are discharged on resistances of 1kΩ for 10ms.

R A(6) B(8)

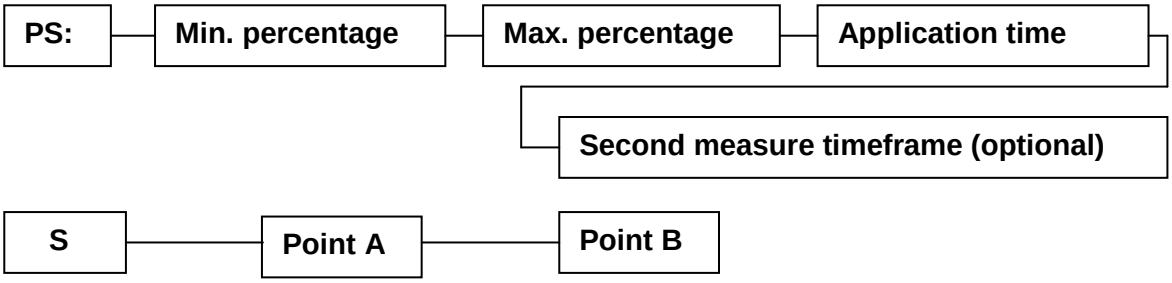
DECHARGE ON from this command, after each measurement test, a discharge of the named points will be carried out.

F A(9) B(10)

D.II.4.3 Variable element test

For elements with an imprecise nominal value. The variable element test (probe, strain gauge, thermistors, etc.) takes the resistance measurement at rest and repeats the measurement after variation to assess the percentage deviation.

Simply enter the percentage range and the measurement current application time (see Resistance measurement).



When reading code S, the tester carries out a resistance measurement between points A and B. It memorises the result.

If a timeframe in seconds (whole value) is given, the second measurement is carried out automatically.

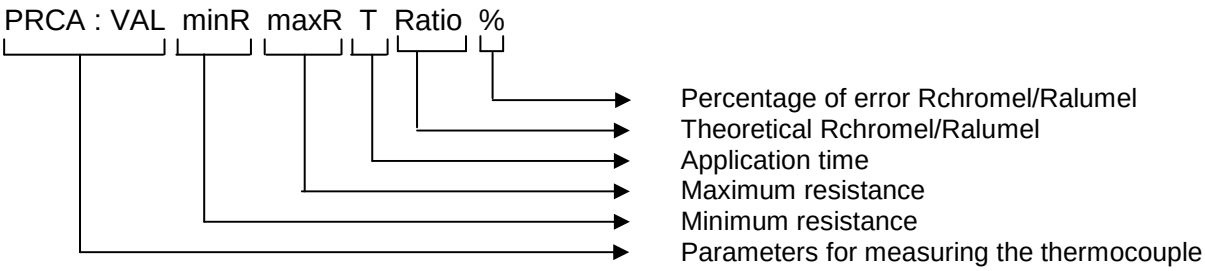
If the timeframe is not given in the parameter, a dialogue box asks the operator a question.

When the operator replies "YES" or the timeframe, a second measurement is made and compared with the percentages given in parameter PS.

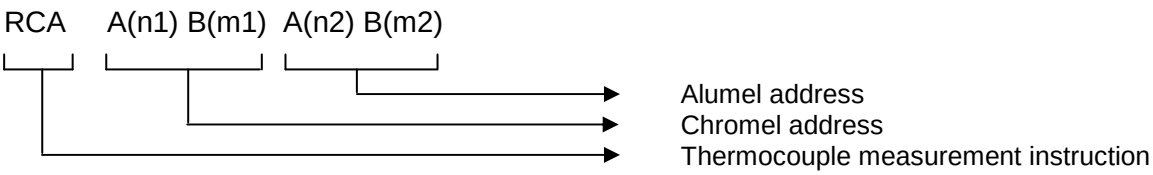
D.II.4.4 Measuring thermocouples

It is possible to measure a type K thermocouple from the comparison of the measurement of 2 Chromel Alumel resistances of the thermocouple. The comparison is made from the resistance values and not from a temperature threshold.

Measurement parameter



Programming the measurement



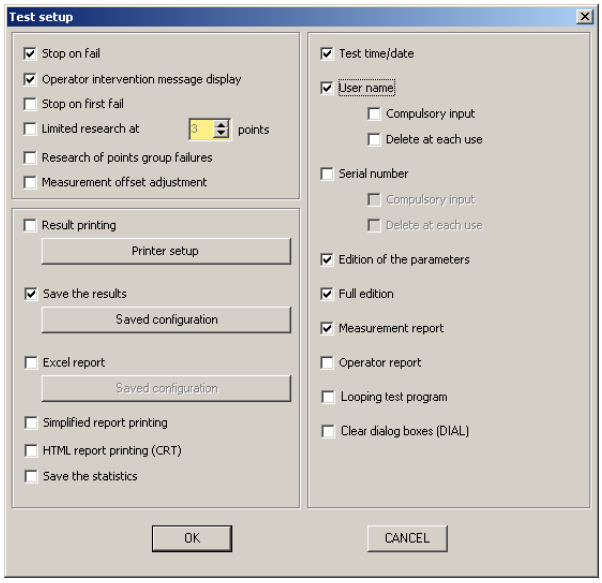
D.II.4.5 TRACE, FINTRACE

Instruction to trace equipment that has PASSED tests from a source file
A text file comprising the list of equipment to be tested (e.g. the equipment serial number) must be created.
Winpass generates an output file (in the same format as the customer input file) in which the equipment that PASSED tests is stated (with the addition of the tester name, operator name and test date at the end of the line).

Instructions:
TRACE ''Fichier_client'' ''Fichier_sortie'' ''Label_du_champs_de_référence''
Nombre_de_champs_décrivant_un_matériel
Index_du_champ_de_référence
''séparateur_de_champs''
. . .
FINTRACE

The TRACE instruction opens a dialogue box asking the operator to select the equipment to be tested (equipment having already PASSED tests no longer appear in the list).
The output_file is automatically stored in the same directory as the Customer_file. Moreover, if no directory is specified in the Customer_file, the latter must be stored in the same directory as the test program.

NOTE: To indicate the operator name in the output file, the "Operator name" option must be ticked in the Test Configuration window.



A piece of equipment is considered to have PASSED if all the tests carried out in the TRACE ... FINTRACE zone PASSED.

The FAILED tests outside of the TRACE zone are not taken into account in the TRACE instruction result (the global test result can be 'FAILED TEST' when the TRACE zone result is a 'PASSED TEST').

The FINTRACE instruction is optional: if it is not present in the test program, the TRACE zone stops at the end of the test program.

Example:

PI : VAL 100 M 500 1 m 10 m 30 m
PC : VAL 0 5 500 m 20 5 m

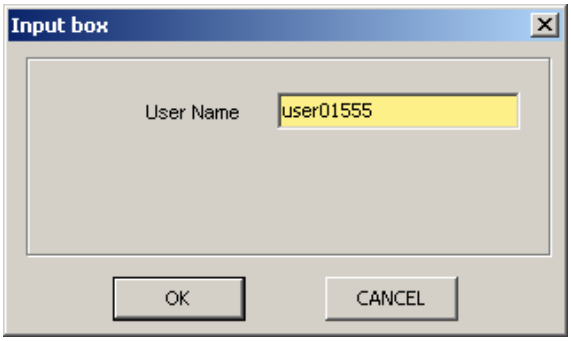
TRACE "C:\sefelec\liste reference.txt" "C:\sefelec\resultat trace test.txt" "serie" 2 1 "-"

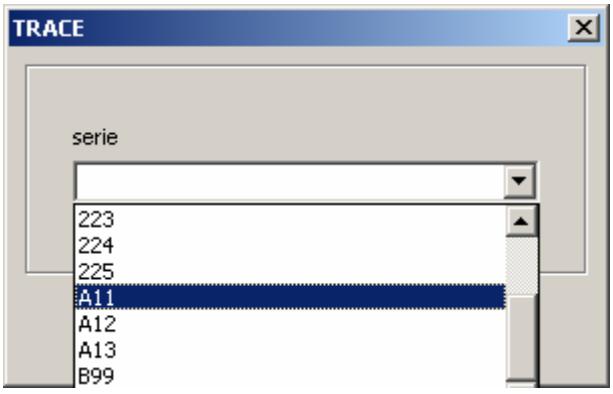
H N 12 (Part test)
I A[1] B[2]
C A[3] B[5]
FINTRACE

The “reference list” file comprises the following serial numbers:
2 fields are listed in this table
Field no. 1 is the serial number of the parts that must be tested.
Field no. 2 is a specific customer code (other columns may be added)

111-M1-
112-M2-
113-M3-
222-M4-
223-M5-
224-M6-
225-M7-
A11-ZA-
A12-ZB-
A13-ZC-
B99-ZD-
B101-ZC-

When the test starts, WINPASS asks the operator for his name or username (if the option was chosen)





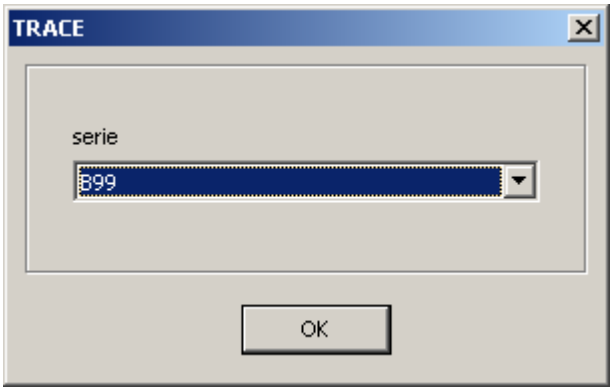
A 2nd dialogue box appears. This presents the serial numbers available in the source file, in a scroll-down list.

The test resumes, here a continuity test between points 1 and 2 and an insulation test between points 3 and 5 of the tester.

If all the program tests are PASSED, **the results file is created** according to the source file format, and the following information is added at the end of the line:

« 112-M2-TESTEUR de câblage 128-Operateur255-08/12/2008- »

112-M2 is the source file columns
128 wiring TESTER is the name given to the tester upon commissioning
Operator255 is the field entered in the dialogue box by the operator
08/12/2008 is the test date given by the computer

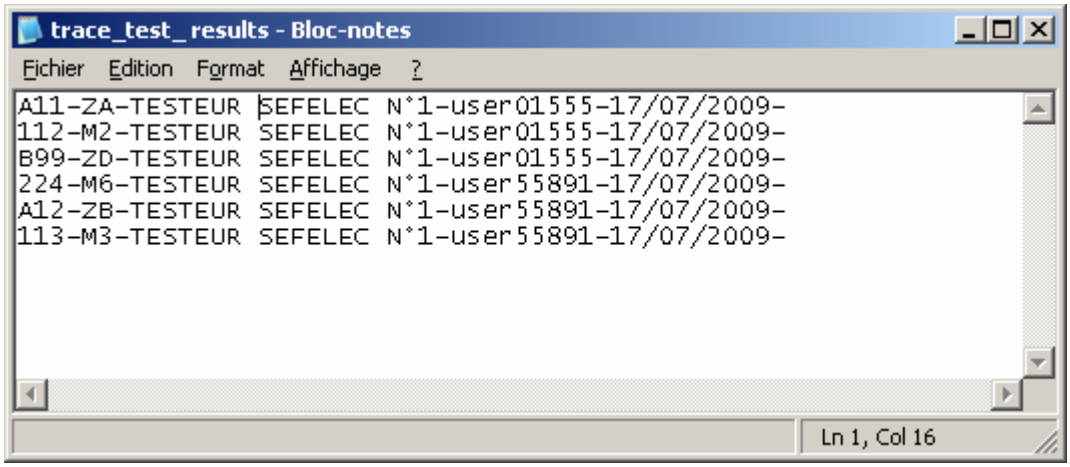


If the same test is carried out, the scroll-down list appears. The serial number 112 no longer appears in the scroll-down list, as it has already PASSED tests.

If the result of this new test is failed,

the results file is not modified. This serial number will still be available for a new test.

After several tests, the traceability results file takes the following form. It displays all of the serial numbers tested only if the test program has been considered as PASSED.



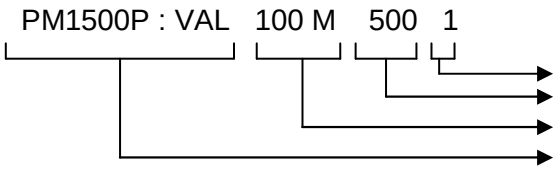
D.III.1 PERIPHERAL DEVICE COMMAND CHARACTERISTICS AND SYNTAX

D.III.1.1 Command codes of the SEFELEC M1500P picoammeter

The parameters of the M1500P can be set at the factory in picoammeter or megohmmeter mode.

Range in picoammeter mode	
Ranges	**Resolution**
00.50 to 20.00 pA	0.01 pA
020.0 to 200.0 pA	0.1 pA
0.200 to 2.000 nA	1 pA
02.00 to 20.00 nA	10 pA
020.0 to 200.0 nA	100 pA
0.200 to 2.000 µA	1 nA
02.00 to 20.00 µA	10 nA
020.0 to 200.0 µA	100 nA
0.200 to 2.000 mA	1 µA
02.00 to 20.00 mA	10 µA

Range in megohmmeter mode	
Ranges	**Resolution**
00.50 to 20.00 pA	0.01 pA
020.0 to 200.0 pA	0.1 pA
0.200 to 2.000 nA	1 pA
02.00 to 20.00 nA	10 pA
020.0 to 200.0 nA	100 pA
0.200 to 2.000 µA	1 nA
02.00 to 20.00 µA	10 nA
020.0 to 200.0 µA	100 nA
0.200 to 2.000 mA	1 µA
02.00 to 20.00 mA	10 µA



Application time in seconds
Test voltage in Volts
Threshold resistance in insulation
Code of M1500P parameters

M1500P A(…….) B(…….) Test with the M1500P between two points

M1500PM A(…….) . Test with the M1500P between point A and all the other points at 0 Volt

M1500PM A(…..)….B(……) . Test with the M1500P between the group of A points and the group of B points at 0 Volt

Table of limit parameters for the M1500P picoammeter in the WINPASS software

Parameter	Minimum value	Maximum value
Threshold resistance in insulation	0	2 GΩ
Test voltage	0	1500 Vdc
Application time	0	99 s

D.III.1.2 Command codes of the dielectrometer SEFELEC XS series

Main measurements carried out by the XS series devices

For the RXS models, rigidity function

For the DXS models, rigidity function + megohmmeter

For the SXS models, rigidity function + megohmmeter + ground continuity + sequence function

Rigidity generator of the XS series

Type of device	Rigidity function
RXS DXS SXS 50	50VA AC
RXS DXS SXS 56	50VA AC and DC
RXS DXS SXS 500	500VA AC
RXS DXS SXS 506	500VA AC and DC

50VA and 500VA generator characteristics

Programmable test voltage: 100 V to 4200Vcc by pitch of 10V ((±5% of the programmed value).

The maximum test voltage depends on the switching board equipping the tester.

Breakdown current detection: 50VA generator: 500 µA to 10 mA (±10% of the value read)
500VA generator: 10 mA to 100 mA (±10% of the value read)

Min. current leakage detection: 50VA generator: 100 µA to 9.99 mA (±10% of the value read)
500VA generator: 1 mA to 99.99 mA (±10% of the value read)

Max. current leakage detection: 50VA generator: 100 µA to 9.99 mA (±10% of the value read)
500VA generator: 1 mA to 99.99 mA (±10% of the value read)

Rise time: 1 s to 99 s (±5% of the value programmed)
Application time: 1 s to 999 s (±5% of the value programmed)
Fall time: 1 s to 99 s (±5% of the value programmed)

Detection mode: "I", IMAX detection by current threshold
"DELTA", DELTA I detection by current variation
"I+DELTA", IMAX + DELTA I are activated at the same time
"FI", FIMAX, detection by current threshold, rapid mode
"FI+DELTA" FIMAX + DELTA I are activated at the same time

The **detection mode** is automatically defined by the tester at the factory, the default mode is "I+DELTA".
A the end of the PXSRC and PXSRA parameters, it is possible to specify the detection mode, in this case the instruction becomes: PXSRC : VAL 500 1 m 9.9 m 1 m 1 5 1 "**FI**"

The detection mode must be written in commas depending on the syntax described in the detection modes at the beginning of this chapter. This parameter is optional; it is not specified, the chosen mode will be the factory configuration one.

See the SEFELEC XS series manual for complete characteristics of the XS series devices.

Point programming follows the rules of tests between two points or tests per group (unitary relays). See the chapter on this subject in the manual attached.

- **Insulation resistance measurement** (DXS dielectrimeter)

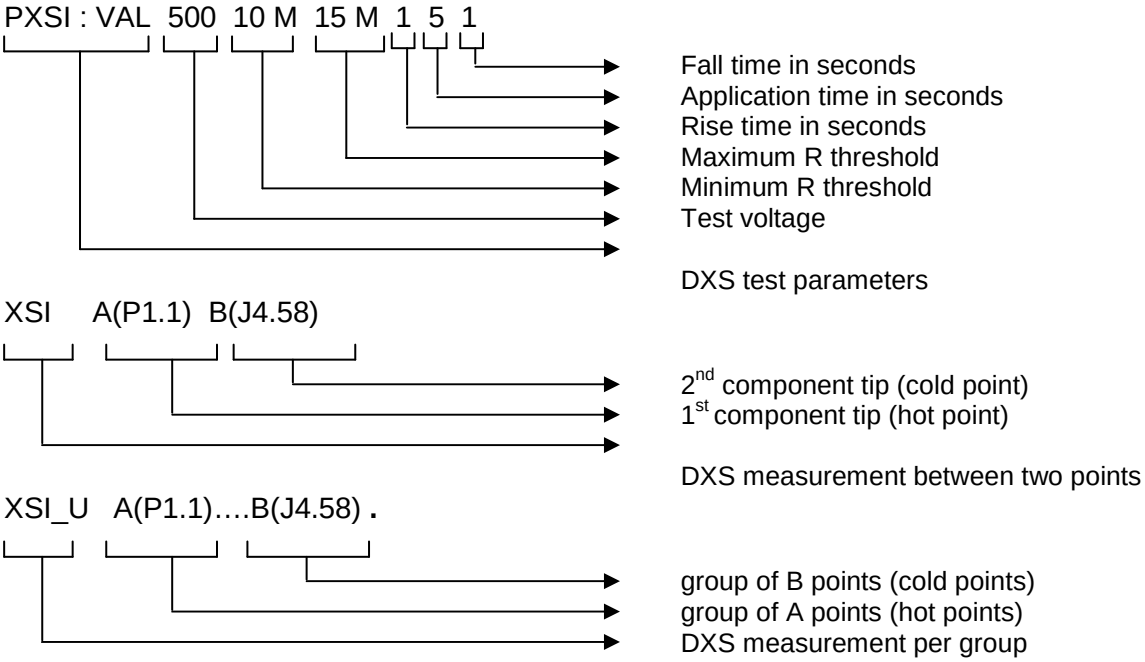

PXSI : VAL 500 10 M 15 M 1 5 1
Fall time in seconds
Application time in seconds
Rise time in seconds
Maximum R threshold
Minimum R threshold
Test voltage
DXS test parameters
XSI A(P1.1) B(J4.58)
2nd component tip (cold point)
1st component tip (hot point)
DXS measurement between two points
XSI_U A(P1.1)….B(J4.58) .
group of B points (cold points)
group of A points (hot points)
DXS measurement per group

Table of limit parameters for the DXS depending on the "Insulation resistance" function

Parameter	Minimum value	Maximum value
Test voltage	10 Vdc	500 Vdc
Threshold resistance	0	200 GΩ
Rise/fall time	0	999 s
Application time	0	999 s

- **Ground continuity measurement** (SXS ground continuity mode)

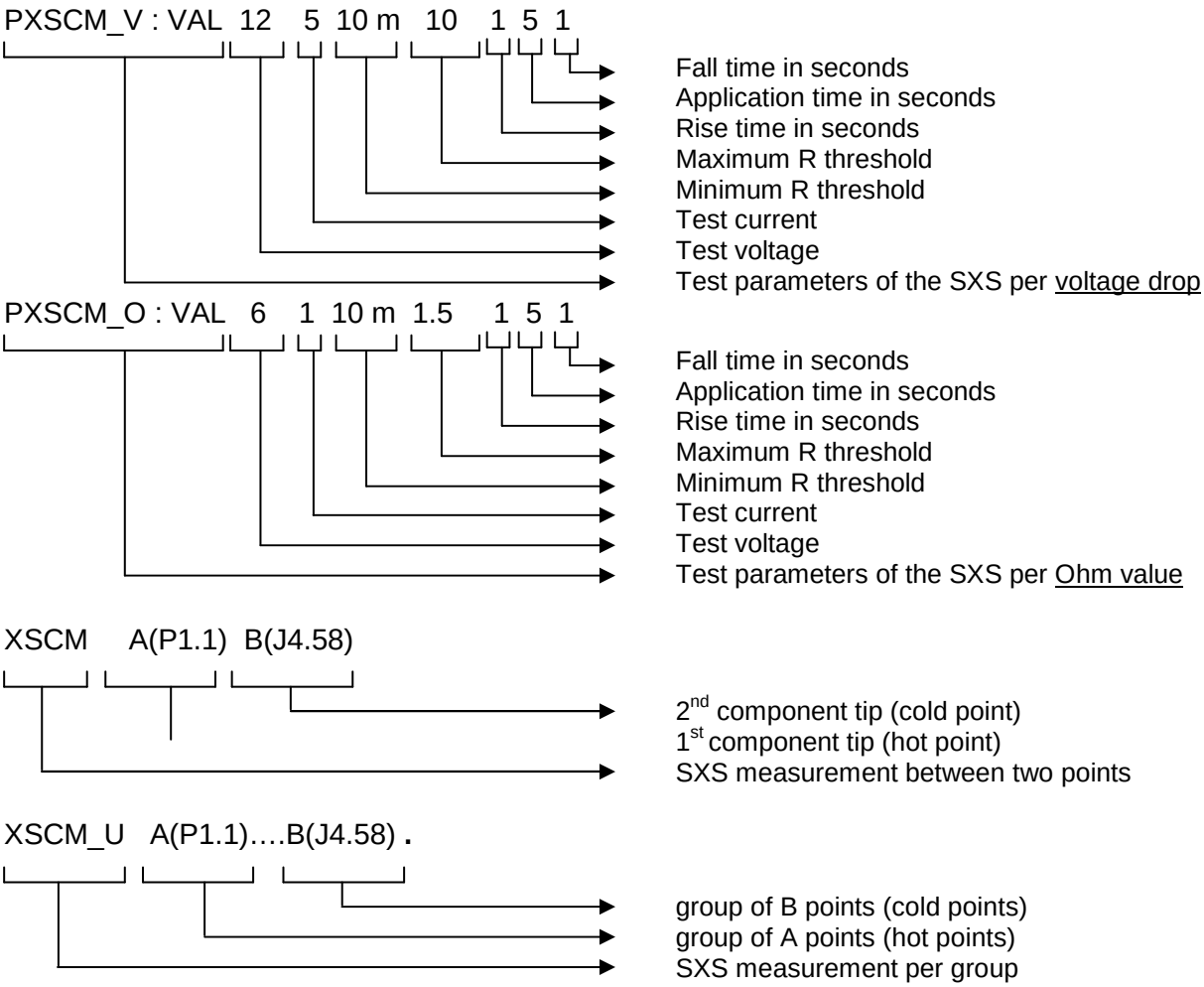
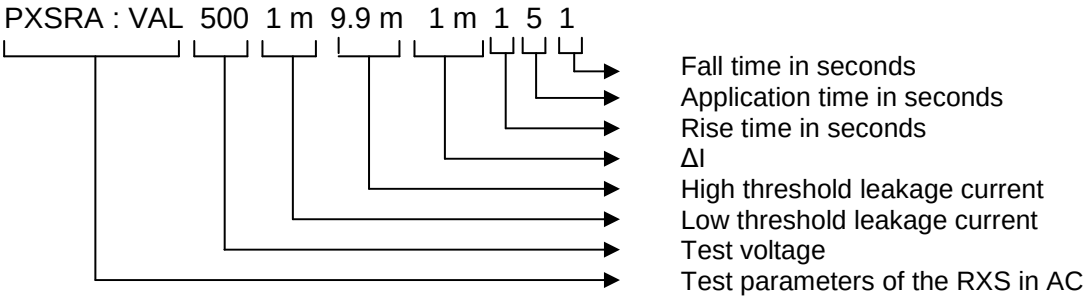
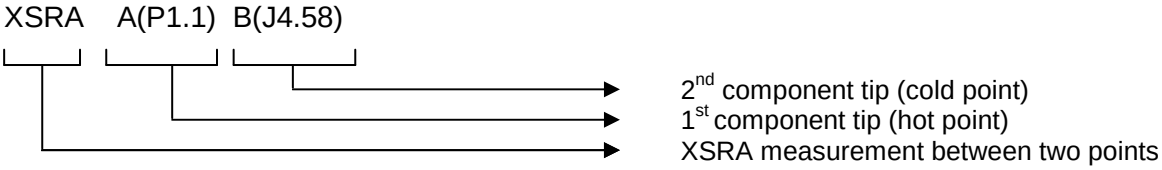

PXSCM_V : VAL 12 5 10 m 10 1 5 1
Fall time in seconds
Application time in seconds
Rise time in seconds
Maximum R threshold
Minimum R threshold
Test current
Test voltage
Test parameters of the SXS per voltage drop
PXSCM_O : VAL 6 1 10 m 1.5 1 5 1
Fall time in seconds
Application time in seconds
Rise time in seconds
Maximum R threshold
Minimum R threshold
Test current
Test voltage
Test parameters of the SXS per Ohm value
XSCM A(P1.1) B(J4.58)
2nd component tip (cold point)
1st component tip (hot point)
SXS measurement between two points
XSCM_U A(P1.1)….B(J4.58) .
group of B points (cold points)
group of A points (hot points)
SXS measurement per group

Table of limit parameters for the SXS in ground continuity mode

Parameter	Minimum value	Maximum value
Test voltage (fixed value)	6 Vdc fixed	12 Vdc fixed
Test current	5 A	30 A (depending on the switching board)
Threshold resistance	0	1.5 Ω
Rise/fall time	0	999 s
Application time	0	999 s

- **Hipot AC measurement** (RXS in hipot mode)


PXSRA : VAL 500 1 m 9.9 m 1 m 1 5 1
Fall time in seconds
Application time in seconds
Rise time in seconds
ΔI
High threshold leakage current
Low threshold leakage current
Test voltage
Test parameters of the RXS in AC



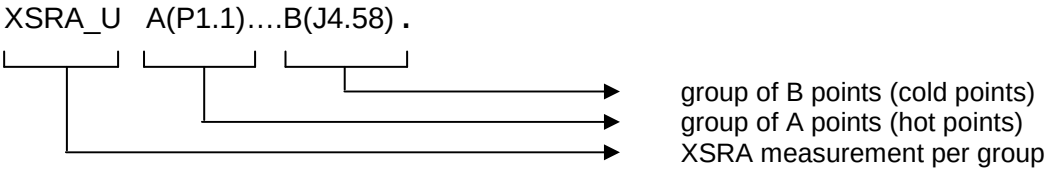
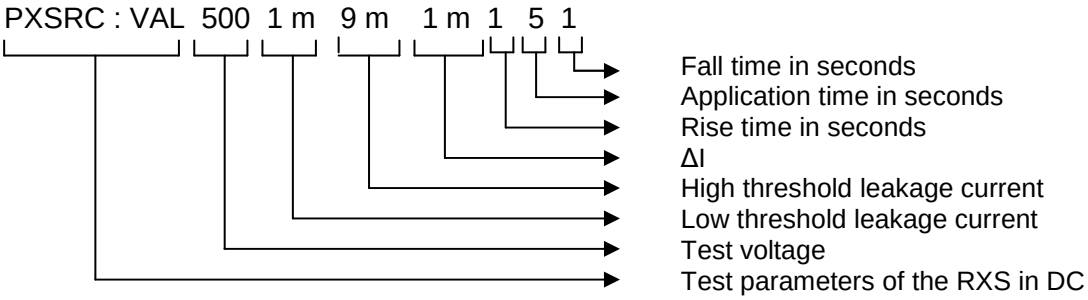
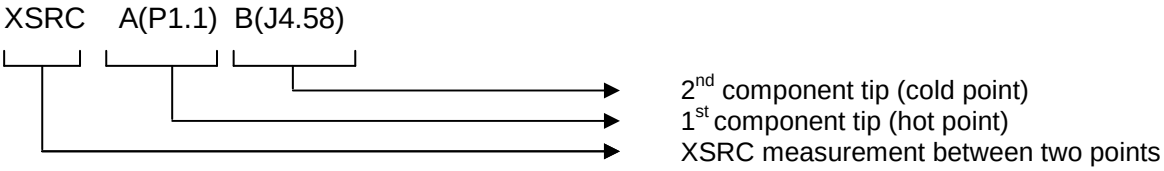


Table of limit parameters for the SXS depending on the "Hipot AC" mode

Parameter	Minimum value	Maximum value
Test voltage	100 Vac	5 KVac
Leakage current	0	9.99 mA
ΔI	1 mA	10 mA
Rise/fall time	0	999 s
Application time	0	999 s

- **Hipot DC measurement** (RXS in hipot mode)


PXSRC : VAL 500 1 m 9 m 1 m 1 5 1
Fall time in seconds
Application time in seconds
Rise time in seconds
ΔI
High threshold leakage current
Low threshold leakage current
Test voltage
Test parameters of the RXS in DC



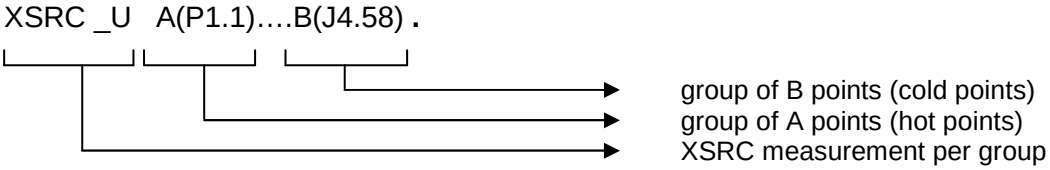


Table of limit parameters for the SXS depending on the "hipot DC" mode

Parameter	Minimum value	Maximum value
Test voltage	100 Vdc	6 KVdc
Leakage current	0	110 mA
ΔI	1 mA	100 mA
Rise/fall time	0	999 s
Application time	0	999 s

D.III.1.3 Command codes of the SEFELEC MGR10 microohmeter:

See the SEFELEC manual for the MGR10. Since this device is intended to measure very low resistances (up to 100 µΩ), it will still be used in "4 wire" mode. Only the uneven tester addresses are programmed as a result (force), the following even address is only reserved for the sense.

Main characteristics of the MGR10 according to the measurement ranges

Range	Resolution	Max. current	Min. current	Resolution	Measurement specification
30 KΩ	1Ω	100 µA	10 µA	1 µA	0.03% of the reading + 0.02% of the range
3 KΩ	100 mΩ	1 mA	100 µA	10 µA	0.03% of the reading + 0.01% of the range
300 Ω	10 mΩ	10 mA	1 mA	100 µA	0.03% of the reading + 0.01% of the range
30 Ω	1 mΩ	100 mA	10 mA	1 mA	0.03% of the reading + 0.01% of the range
3 Ω	100 µΩ	1A	100 mA	10 mA	0.03% of the reading + 0.01% of the range
200 mΩ	10 µΩ	10A	1A	100 mA	0.03% of the reading + 0.01% of the range
30 mΩ	1 µΩ	10A	1A	100 mA	0.03% of the reading + 0.01% of the range
3 mΩ	0,1 µΩ	10A	1A	100 mA	0.03% of the reading + 0.02% of the range

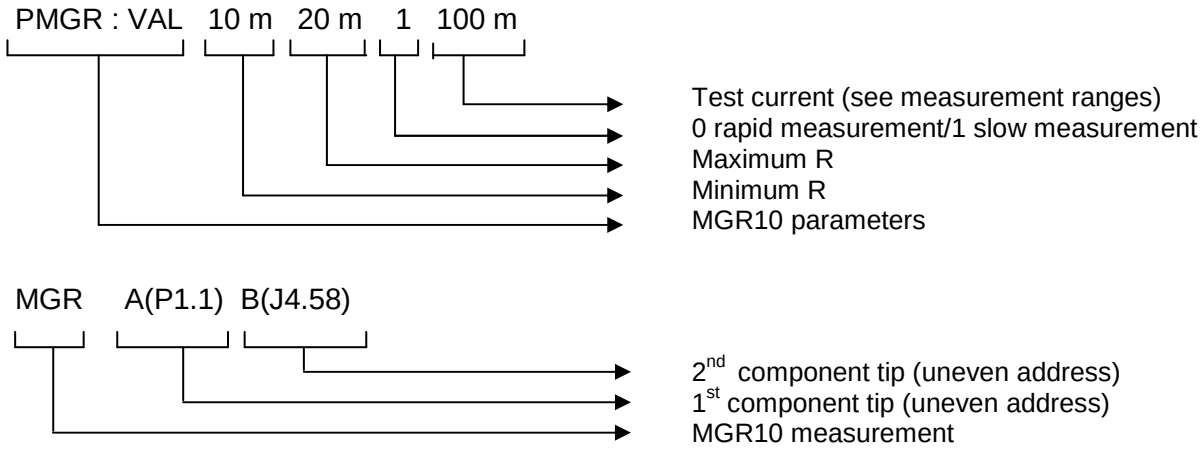


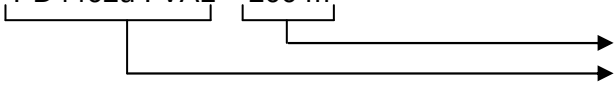
Table of limit parameters for the MGR10 microohmmeter in the WINPASS software

Parameter	Minimum value	Maximum value
Resistance	0	30 KΩ
Test current	Depending on the resistance measurement range (see table above) 10 µA	Depending on the resistance measurement range (see table above) 2A with standard switching board 10 A with 40680 switching board

D.III.1.4 Command codes of the BURSTER D4462 voltage standard

See the BURSTER D4462 manual

PD4462u : VAL 200 m



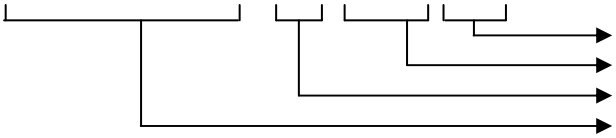
DC voltage generation
Parameter of the D4462 in DC

D4462u ON / OFF — activation/deactivation of the D4462

D.III.1.5 CHROMA 6404 power supply command

See CHROMA power supply manual

PCHROMA : VAL : 110 500 m 60



Frequency in Hz
Current
Voltage
Test parameters of the CHROMA power supply

CHROMA ON / OFF — activation/deactivation of the CHROMA 6404

D.III.1.6 Commands of the AGILENT 34401A multimeter

See the AGILENT multimeter manual

- **DC voltage measurement**

PMVDC : VAL (Vdc min) (Vdc max)
MVDC A(…..) B(…..)

- **AC voltage measurement**

PMVAC : VAL (Vac min) (Vac max)
MVAC A(…..) B(…..)

- **Two-wire resistance measurement**

PMR : VAL (R min) (R max)
MR A(…..) B(…..)

- **Four-wire resistance measurement**

PMR4 : VAL (R min) (R max)
MR4 A(…..) B(…..)

- **Measurement of direct current at the terminals of a shunt**

PMVDC_I : VAL (Idc min) (Idc max) (R shunt)
MVDC_I A(…..) B(…..)

- **Measurement of alternating current at the terminals of a shunt**

PMVAC_I : VAL (Iac min) (Iac max) (R shunt)
MVAC_I A(…..) B(…..)

Table of limit parameters for the AGILENT 344101A multimeter in the WINPASS software

Parameter	Minimum value	Maximum value
PMVDC	0	500Vdc
PMVAC	0	500Vac
PMR & PMR4	0	10 MΩ
Current for PMVDC_I & PMVAC_I	Min. current 0	Max. current 2A
Rshunt for PMVDC_I & PMVAC_I	0	10 MΩ

D.III.2 INPUTS/OUTPUTS OF THE PCI-7250 AND PCI-7251 LOGIC CONTROL CARD

Card inserted in the computer on a PCI slot. Connection is made directly on the card on a female SUB-D37 connector. The card is controlled by the WINPASS software.

D.III.2.1 Card characteristics

Relay outputs

Number: 8 (4 reversing relays, 4 Normally Open relays)

Interrupting capacity: 120Vac/dc, 0.5A

24Vdc, 1A

Switching time: 8ms

Contact insulation resistance 100MΩ

Digital inputs

Number: 8

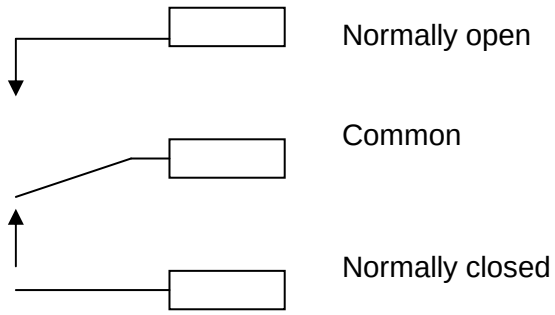
Input current: 10mA

Input voltage: 24Vdc or 24Vac 50 – 1000Hz/low logic state 0-1V/high logic state 5-24V

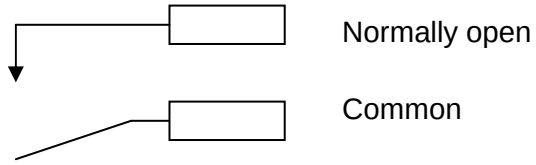
Input impedance 2.2kΩ

D.III.2.2 Schematic diagram of the relay outputs

This format concerns relay numbers 1 to 4 (NO1 - COM1 - NC1... on the connector diagram).

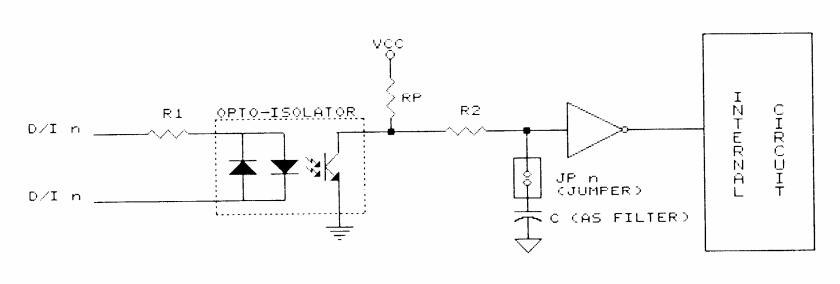


This format applies to relay numbers 5 to 8 (NO5 – COM5 … on the connector diagram).



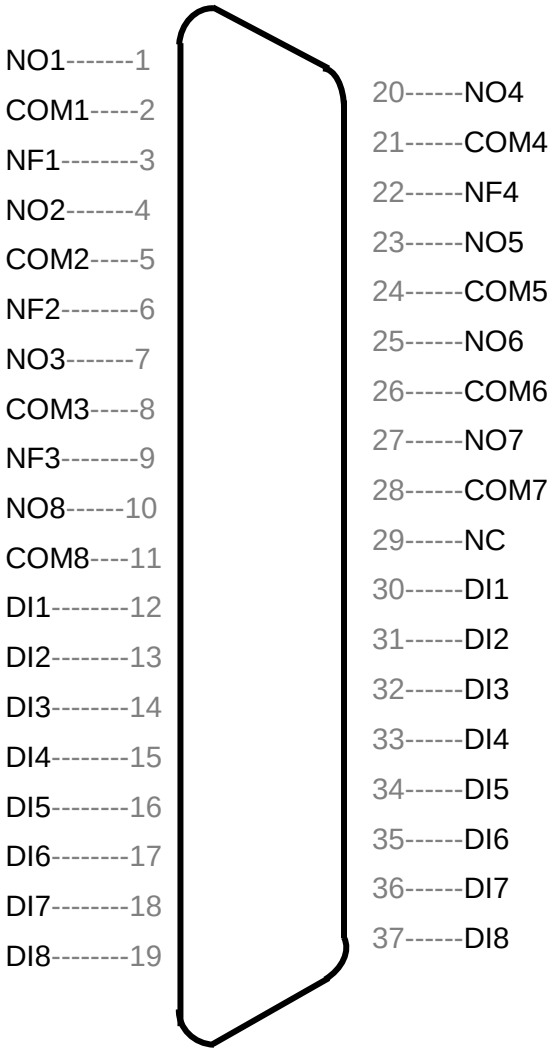
D.III.2.3 Schematic diagram of the optocoupled inputs

DI1 – DI1, DI2 – DI2… on the connector diagram



D.III.2.4 Diagram of the female SUB-D37 connector of the card

Front view



D.III.2.5 Syntax

RELAY COMMANDS:

SO1 : n	The “n” relay is placed in the work position.
SO0 : n	The “n” relay is placed in the rest position.
SOM : n	The “n” relay is placed in the work position if at least one of the previous tests is failed.
SOB : n	The “n" relay is placed in the work position if all of the previous tests are passed.
SOC : n	The “n" relay is placed in the work position if the previous test is failed.

VOLTAGE DETECTION:

If the input/output card is used to direct the relays in the wiring (routing of a power supply), the following rules must be followed:

- Do not carry out any other measurement than the voltage measurement on the multiplexer connected to the wiring power supply points.
- Do not carry out multiple tests (‘EI’, ‘ED’, ‘EN’) if a power supply is routed.
- Carry out tests to check that the wiring is correct before directing the relays.
- Use the voltage detection option in the test zones where the relays are directed.

The voltage detection option is programmed by two instructions: STIMULI to indicate the start of a test zone with relay steering and FINSTIMULI to indicate that all the power supplies are deactivated.

In the test zones where the voltage detection option is programmed, the multiple tests ('EI', 'ED', 'EN') are prohibited and a voltage absence test is carried out systematically before each test between two points.

COMMAND OF DIGITAL INPUTS:

SE : n	This command blocks the test programme awaiting transfer to the logic value “1” on the input “n”.
SE1 : n	Is equivalent to the SE:n command
SE0 : n	Blocks the test program awaiting a low level on the input “n”.

It is possible to interrupt the wait for the SExx instructions by clicking on the button located at the bottom of the WINPASS Tester screen: “STOP INTERROGATION INPUT”. The program then resumes as normal.

D.III.3 FUNCTIONAL TESTS – STIMULI CARD 40680 AND 40575

Functional tests use power supplies outside the tester measurement so as to stimulate the devices (relays, etc.) in the equipment being tested. These external sources often stay on while the tester carries out a cycle of measurements (state of contacts, indicator lamps, etc.). Precautions must therefore be taken to ensure there are no conflicts between the measurement current and stimuli, or worse, short-circuits in the power supplies.

For this, the zones using power supplies shall be bracketed by STIMULI and FINSTIMULI codes.

In these zones, WINPASS bans all tests by global groups, i.e. closes off all cold points (EI, EIU, ED, II, IU, EJ, etc.). The only one allowed is IU A(….) …… B(….) …. B(….) . , i.e. a test where B points are described as, in this case, the programmer has control over the points described and can therefore avoid dangerous conflicts.

In the event that capacitors or values above 100 nF are present, a specific measurement "**Ic**" is planned, enabling discharge before and after the test. This avoids weakening the relays of the switching cards which must not switch current.

Two cards allow use of stimuli

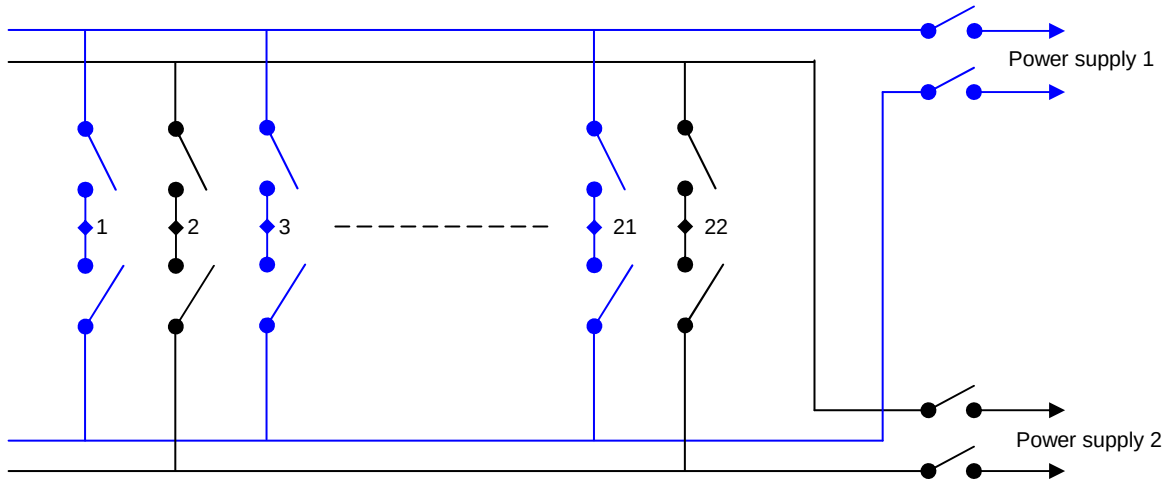
Card 40680 for Tester SYNOR 4207 and 4208 (unitary relay)

Card 40575 for Tester SYNOR 1202, 4202, 4203 (multicontact relay

D.III.3.1 Using card 40680

Card 40680 can be used as a measurement card to steer a SEFELEC MGR10 microohmeter or as a stimuli card. It has been designed to connect one or two power supplies on 22 output channels. 40680 “stimuli” cards can be placed anywhere in the tester (SYNOR 4207 or 4208). If there are several of them, they do not have to be contiguous.

a Principle diagram



When there is just one power supply, power supply 1 and 2 outputs are gathered together.

With the unitary-relay card, each contact can be programmed separately.

1 - Switching of a single power supply

It is possible to use a single power supply. This is addressable on all output channels without restriction. For example: command of a relay coil between points 5 and 22.

The programming can affect the polarity of output channels by using the same principle as the tests between two points (point A, hot point of the power supply, point B, cold point).

2 – Switching of two power supplies

It is possible to use two power supplies. In this case, power supply “1” is addressable on the odd points and power supply “2” on the even points. For example: command of a relay control with power supply 1 between points 5 and 21 and with power supply 2 between points 12 and 14.

The programming can affect the polarity of output channels by using the same principle as the tests between two points (point A, hot point of the power supply, point B, cold point).

Note: depending on the construction of the tester, the status of a power supply can change from one rack to another as well as the number. For example, a tester with 2 racks (2 times 16 slots) can control 4 different power supplies or a single one with two cards 40680, placed in each rack.

3 - Programming

What follows assumes knowledge of WINPASS programming (see the programming sheet that comes with the tester)

b Power supply control.

RP680_C_10_2

- Number of power supply (1 or 2)
- Row of the “stimuli” card
- Command (activation) of the power supply
- Command of a power supply on a 40680 card

RP680_A_10_2

- Number of power supply (1 or 2)
- Row of the “stimuli” card
- Stop (deactivation) of the power supply
- Command of a power supply on a 40680 card

c Programming of channels

The channel addresses cannot be transcoded.

RF680_21_2_ A[xx] B[xx]

- Address of the cold point [1 to 22]
- Address of the hot point [1 to 22]
- Number of power supply
- Row of the “stimuli” card
- Closing (activation) of the channel

RO680_21_2_ A[xx] B[xx]

- Address of the cold point [1 to 22]
- Address of the hot point [1 to 22]
- Number of power supply
- Row of the “stimuli” card
- Opening (deactivation) of the channel

RX General resetting (all power supplies and all channels of all racks)

Note: if there is only one power supply, it will always be power supply 1, and points A and B will run from 1 to 22.

WARNING : If there are two power supplies, A and B will be chosen in the odd addresses for power supply 1 (1, 3, 5, … 19, 21), and even for power supply 2 (2, 4, 6, … 20, 22). The WINPASS syntaxic corrector controls these addresses.

- **Example 1:**

Either rack 1 with a single power supply (24 V) and a 40680 "stimuli" card in row 16. The relay coil is connected between outputs 5 and 18, the + 24 V being in 18.

REM command of the 24 V power supply

RP680 C 16 1

REM Test of open contacts

PI : VAL 10 M 200 1 m 10 m 100 m

I A(P1.A) B(TB4.8)

REM dispatch of 24 V on outputs 18 and 5

RF680 16 1 A(18) B(5)

REM Test of closed contacts

PC : VAL 0 5 500 m 20 5 m

C A(P1.A) B(TB4.8)

REM break of 24 V on outputs 18 and 5

RO680 16 1 A(18) B(5)

REM stop of the 24 V power supply
RP680 A 16 1

- **Example 2:**

Or rack 2 with power supply 1 at 24 V and power supply 2 at 72 V. The 40680 "stimuli" card is in position 4. The relays are placed according to the table below:

Relay A	9	1	24 V	P1.2	P2.E
Relay B	3	1	24 V	P1.3	P2.K
Relay C	2	4	72 V	P1.4	P2.A
Relay D	8	22	72 V	P1.5	P2.M

Note that relays A and B have a common cold point, 1.

REM Test of open contacts of all relays

PI : VAL 10 M 100 1 m 10 m 100 m

PC : VAL 0 5 100 m 20 5 m

I A(P1.2) B(P2.E)

I A(P1.3) B(P2.K)

I A(P1.4) B(P2.A)

I A(P1.5) B(P2.M)

REM power supply control

RP680 C 4 1

RP680 C 4 2

REM command of relays

RF680 4 1 A(9) B(1)

RF680 4 2 A(8) B(22)

REM test of contacts

C A(P1.2) B(P2.E)

C A(P1.3) B(P2.K)

I A(P1.4) B(P2.A)

I A(P1.5) B(P2.M)

REM command of relays

RO680 4 1 A(9) B(1)

RO680 4 2 A(8) B(22)

RF680 4 1 A(3) B(1)

RF680 4 2 A(2) B(4)

REM test of contacts

I A(P1.2) B(P2.E)

I A(P1.3) B(P2.K)

C A(P1.4) B(P2.A)

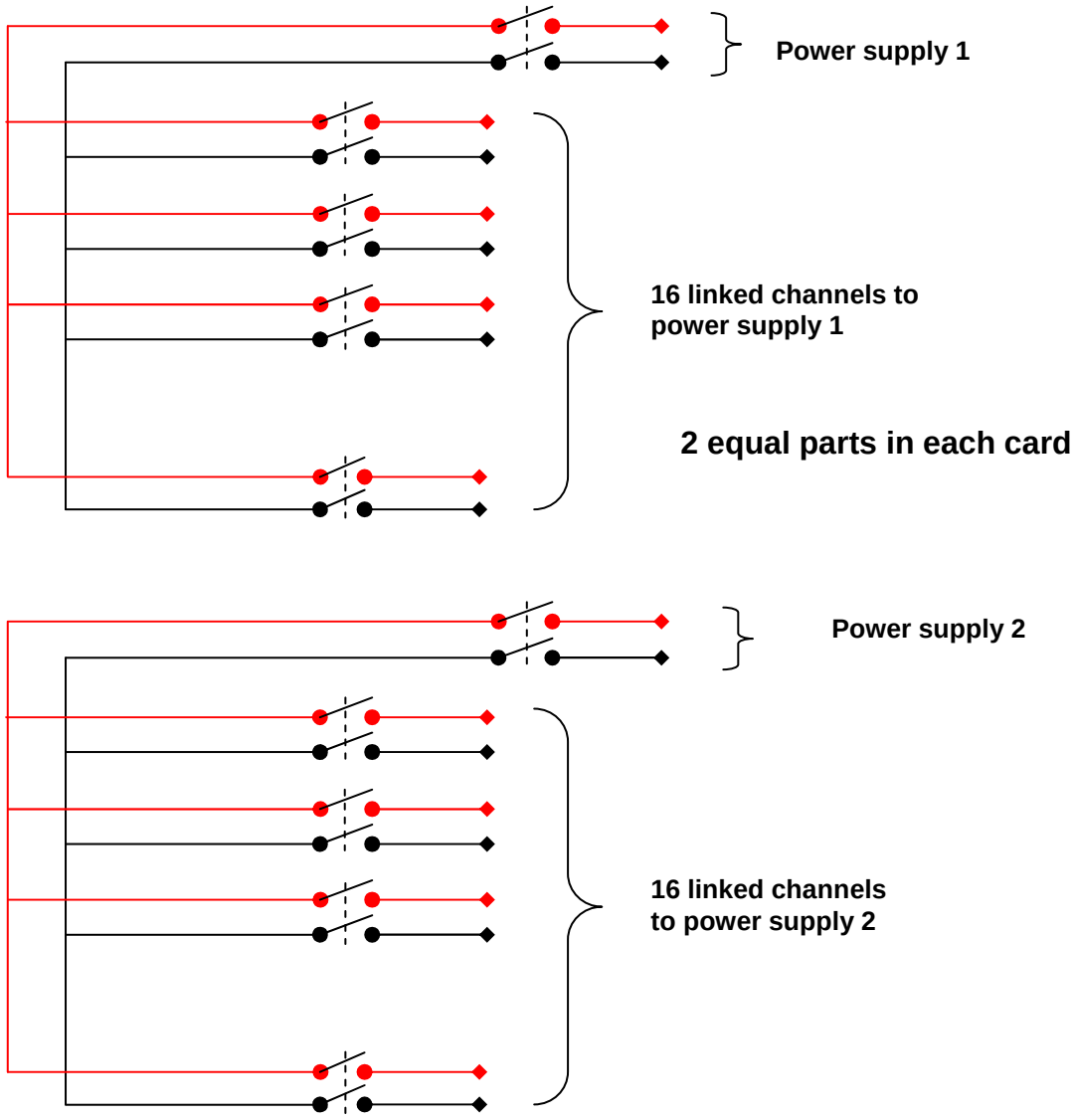
C A(P1.5) B(P2.M)

REM overall resetting

RX

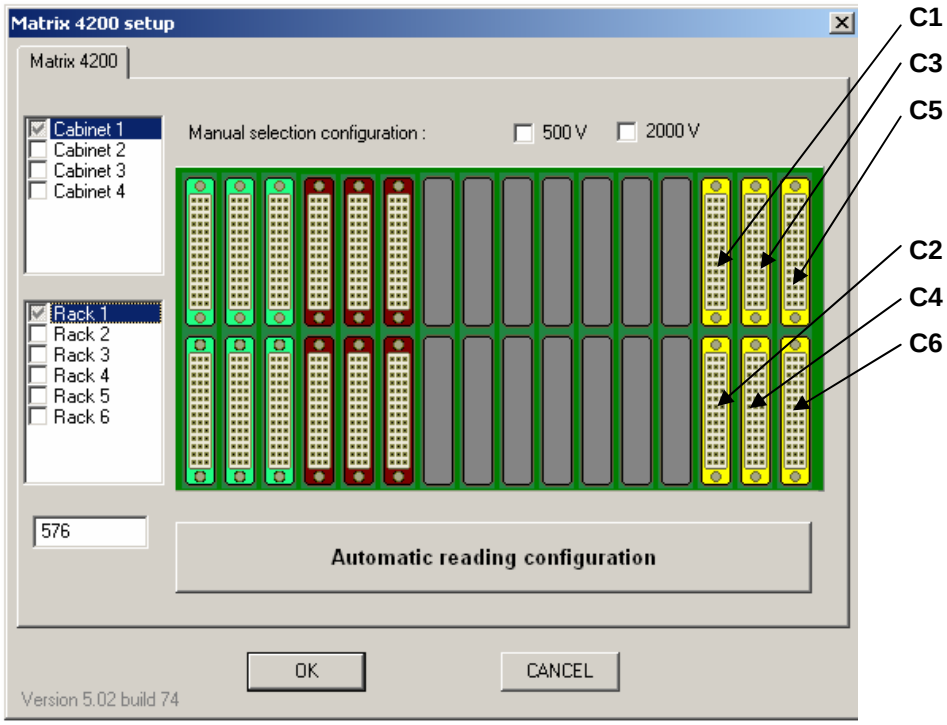
D.III.3.2 Using card 40575

This card has two groups of relay allowing to orders power supply on 16 channels. These power supply must be external or delivered from Tester


Power supply 1
16 linked channels to power supply 1
2 equal parts in each card
Power supply 2
16 linked channels to power supply 2

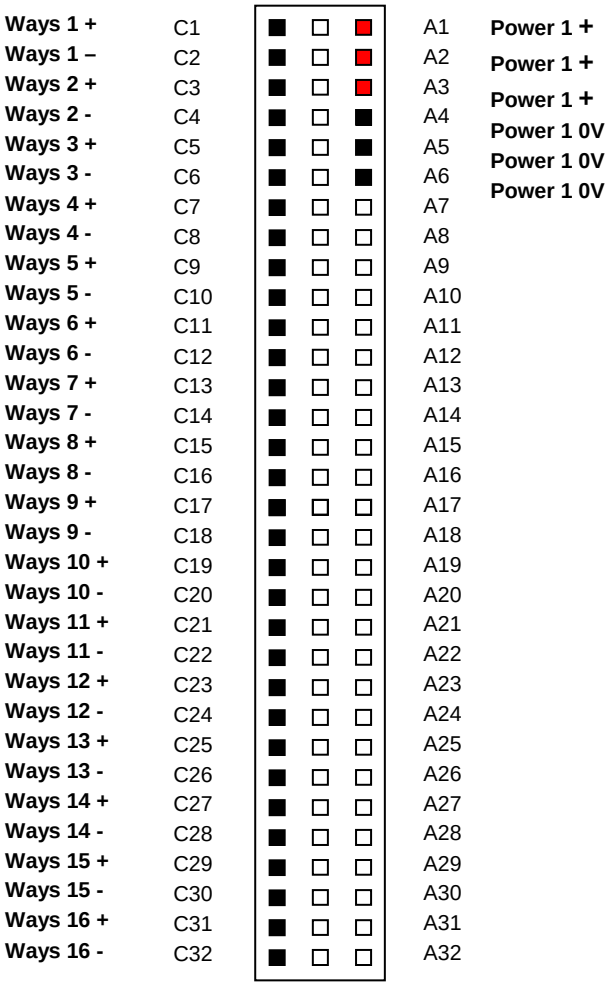
a Installation

These cards are still installed at the end of the rack, their setup is manually made (automatic setup only recognize standard cards). Only SEFELEC technician have to do this setup. The setup is visible from matrix 4200 setup (cards 40575 are in yellow)


Matrix 4200 setup
Matrix 4200
Cabinet 1
Cabinet 2
Cabinet 3
Cabinet 4
Manual selection configuration :
500 V
2000 V
Rack 1
Rack 2
Rack 3
Rack 4
Rack 5
Rack 6
576
Automatic reading configuration
OK
CANCEL
Version 5.02 build 74
C1
C3
C5
C2
C4
C6

b Program

The ways numbering is made as follows


Ways 1 + C1 A1 Power 1 +
Ways 1 – C2 A2 Power 1 +
Ways 2 + C3 A3 Power 1 +
Ways 2 - C4 A4 Power 1 0V
Ways 3 + C5 A5 Power 1 0V
Ways 3 - C6 A6 Power 1 0V
Ways 4 + C7 A7
Ways 4 - C8 A8
Ways 5 + C9 A9
Ways 5 - C10 A10
Ways 6 + C11 A11
Ways 6 - C12 A12
Ways 7 + C13 A13
Ways 7 - C14 A14
Ways 8 + C15 A15
Ways 8 - C16 A16
Ways 9 + C17 A17
Ways 9 - C18 A18
Ways 10 + C19 A19
Ways 10 - C20 A20
Ways 11 + C21 A21
Ways 11 - C22 A22
Ways 12 + C23 A23
Ways 12 - C24 A24
Ways 13 + C25 A25
Ways 13 - C26 A26
Ways 14 + C27 A27
Ways 14 - C28 A28
Ways 15 + C29 A29
Ways 15 - C30 A30
Ways 16 + C31 A31
Ways 16 - C32 A32

- Relay and power supply have to be in **rack 1**.
- The ways numbering is made as shown program drawing
- Power supply setup is made in the order of connectors, according previous picture. Connector C1 power supply has the address 1, Connector C2 power supply has the address 2… Connector C6 power supply have the address 6
- For relay, for connector C1, ways addresses are from 1 to 16, for C2 from 17 to 32… for C6 from 80 to 96…

c Syntax

Define STIMULI area

STIMULI

Test instructions

FINSTIMULI

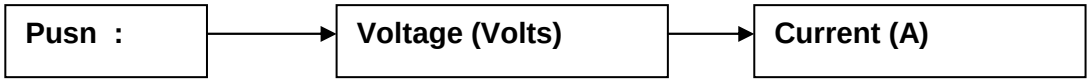
The area using power supplies shall be bracketed by STIMULI and FINSTIMULI command codes. They replace command code PRESENCETENSION and ARRETTENSION (old command code)

They forbid the use of following command code, net tests, voltage detection, disable probe and manual mode

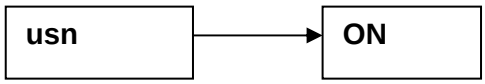
d Power supply instruction

This is made in two time :

1 – Program and activate power supply



n is the power supply number.



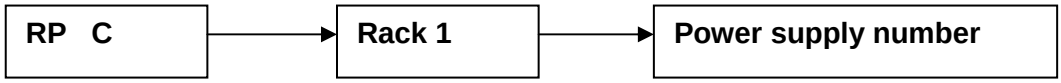
Example : Programmable power supply 3 at 25V and 500mA and activation

Pus3 : 25 500 m

us3 ON

Activation may be anytime, it's the last power supply parameter which is used

2 – Switching of the external power supply (this power supply can be programmable or not)



***For information** : power supply are always in rack 1.*

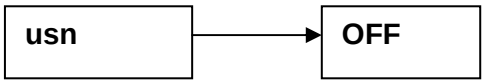
Example : Programmable power supply nr 1 at 32 V, 1 A on connector C2

Pus1 : 32 1

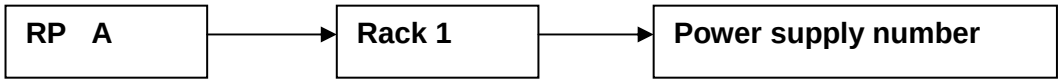
Us1 ON

RP C 1 2

deactivation of programmable power supply are made with command code :



Shut down of power supply are made with command code:



Example : Programmable power supply nr 2 at 5V, 100mA on connector C4

Pus2 : 5 100 m

us2 ON

RP C 1 4

Command code for cable testing (between two points)

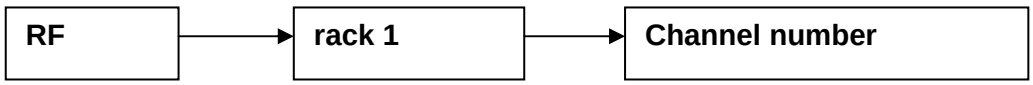
RP A 1 4

us2 OFF

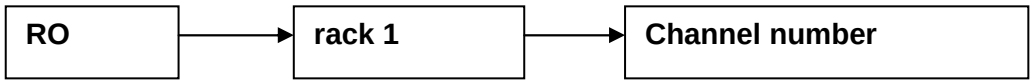
e Programming of channels

In order to to select and control each channel, one has to open or close each corresponding relay (cabled on the output connector)

1 – Closing relay to activate the corresponding channel.



2 – Opening relay to desactivate the corresponding channel.



General resetting (all power supply and all channels in the rack)

RX

The RX command code allows to reset all relay and all power supply activate previously. The command code FINSTIMULI do the same, nevertheless you can do a general reset ting without closing STIMULI zone

D.III.4 EXAMPLE PROGRAM

D.III.4.1 The test program

```
REM{************First part*************}
HN
H(Test of chassis S3400 - ind 3 - diagram 40300-3)
H()
H(Connect tools)
H(Check absence of components)
Y
DIAL : dialogue1
REM{************Second part*************}
PC : VAL 0 5 2.5 20 0.005
PI : VAL 100 M 500 1000µ 0.01 0.1
REM {resistance of tools 3.7Ω }
TARE : 3.7
        EI   B[1] B[5] B[10] B[11] B[15] B[20] B[21] B[25] B[30]
                B[31] B[35] B[40] B[41] B[45].
        EI   B[2] B[7].
        EI   B[3].
        EI   B[4].
        EI   B[6].
        EI   B[8] B[9] B[28] B[44].
        EI   B[12].
        EI   B[13].
        EI   B[14] B[16] B[18] B[34] B[38] B[50].
```

```
        EI   B[17] B[46].
        EI   B[19] B[24].
        EI   B[22].
        EI   B[23].
        EI   B[26] B[29] B[33].
        EI   B[27].
        EI   B[32].
        EI   B[36].
        EI   B[37].
        EI   B[39].
        EI   B[42] B[43] B[47].
        EI   B[48].
        EI   B[49].
REM{***********Third part*************}
TESTM
H (The preceding tests are bad)
H(repair and start test again)
FTEST
REM{***********Fourth part*************}
TESTB
H (fit components)
Y
HV (test of resistances)
PR: VAL 325 340
        R   A[36] B[37]
        R   A[37] B[39]
PR: VAL 990 1100
        R   A[22] B[23]
HV (test of condenser)
PF: 90n 110n
        F   A[48] B[49]
HV(test of diode D1)
Pd: 0.6 0.8 0.1
        d   A[3] B[4]
H (test of switches)
H (set K1 K2 K3 to ON)
Y
        C   A[51] B[52]
        C   A[51] B[53]
        C   A[51] B[54]
H (set K1 K2 K3 to OFF)
Y
        I   A[51] B[52]
        I   A[51] B[53]
```

I A[51] B[54]

H (if the test is GOOD, disconnect tools).

FTEST

D.III.4.2 Comments on test program

All the points described are in tester addresses.

a First part

The first code indicates to the tester that it is to operate at high level. Next, the unconditional texts identify the program and give instructions to the operator.

The last instruction in this part calls up a dialogue box (file " dialogue1.DIA"), in which the programmer asks the operator for information such as his name, the serial number, etc. (as mentioned earlier, the fields in this box can be attached to the name of the result file).

b Second part

This part carries out the wiring test excluding the components, i.e. wires only. The codes used are those of the net tests, so the parameters for continuity and insulation (PC and PI) have to be described first. In order to refine the measurements of continuity, the programmer has added the value of the interface (TARE VALUE: 3.7).

c Third part

Here the condition "test bad" is used. The text will not be printed unless one of the preceding tests is bad. If all the tests are good, this part will not be executed and the test will go on to the fourth part. If this is not the case, the test will stop here;

d Fourth part

Unlike the third part, the following tests are only possible if the wiring test in the first part is satisfactory. Fitting of the components is therefore requested, and the tester, with the appropriate parameters, will test three resistances, a condenser, a diode and switches.

D.III.5 SUMMARY OF PROGRAMMING CODES

PROGRAMMING ADDRESSES

A[nnnn]	Measurement hot point in tester address *(test between two points or unitary relays)*
A(c.b)	Measurement hot point in user address *(test between two points or unitary relays)*
A< List of Points >	List of Points in measurement hot point *(unitary relays)*
B[nnnn]	Definition of points of a net or measurement cold point in tester address *(test between two points or unitary relays)*
B(c.b)	Definition of points of a net or measurement cold point in user address *(test between two points or unitary relays)*
B< List of Points >	Definition of points of a net by List of Points or measurement cold points *(unitary relays)*

PARAMETERS

PI:	measurement parameters (Short-circuit+insulation+highpot)
PId:	measurement parameters (Short-circuit+highpot)
PJ:	measurement parameters for dielectric strength *(option)*,
PC:	measurement parameters for continuity
PR:	measurement parameters for resistance
Pb:	measurement parameters for shielding
PF:	measurement parameters for capacitance
P4:	measurement parameters for 4 wires (Kelvin methode)
Pd:	measurement parameters for diodes < 20V
Pdz:	measurement parameters for diodes > 20V
PS:	Measurement variable element (% and application time)
PVA:	measurement parameters for alternating current *(option)*
PVC:	measurement parameters for direct current *(option)*
PLR:	measurement parameters for self-inductance *(option)*
PCR:	measurement parameters for condensers on AC *(option)*
PZL:	measurement parameters for self-inductance impedance *(option)*
PZC:	measurement parameters for capacitance impedance *(option)*
PGM:	measurement parameters for GMOV *(option)*
Pu:	voltage/current generation parameters *(option)*
Pue:	external power supply control parameters *(option)*
TARE: n.n	resistance of tool for deduction

TEST OF NETS

EI	short-circuit + highpot + insulation + continuity
EId	short-circuit + highpot + continuity
EJ	dielectric strength (short-circuit + highpot + continuity) *(option)*
ED	short-circuit + continuity
II	highpot + insulation + continuity
IJ	dielectric strength (highpot + insulation + continuity)
EN	no overall test + continuity

TEST BETWEEN 2 POINTS

I	measurement of insulation
Ic	measurement of insulation (capacitive load)
NI	measurement of non-insulation
J	measurement of dielectric strength, AC (option),
C	measurement of continuity
D or NC	measurement of non-continuity
4	measurement of continuity, 4 wires (Kelvin method)
R	measurement of resistance
R4	measurement of resistance, 4 wires (Kelvin method)
F	measurement of capacity
b	measurement of shielding
bm	measurement of shielding by the three-measurements method (option on unitary relays)
d	measurement of diodes < 20V (current test)
dz	measurement of diodes > 20 V (set voltage test)
S	measurement of variable test (% before and after variation)
LR	measurement of inductance (option)
CR	measurement of condenser on AC (option)
VA	measurement of AC voltage (option)
VC	measurement of DC voltage (option)
ZL	measurement of self-inductance impedance (option)
ZC	measurement of capacitance impedance(option)
GM	measurement of GMOV (option)
GU	generation of voltage
u	generation of voltage/current associated with the letter S or O (option)
ue	external power supply control associated with the letter S or O (option)
N	no test

MULTIPLE TESTS

IM	test of insulation of one point among all the others in direct current: IM A(nnnn)
JM	test of insulation of one point among all the others in alternating current: JM A(nnnn) (option):
CM	test of continuity of one point among all the others CM A(nnnn)

SLIPS RING TESTING

4M	test of a 4 wires point, others being parallel
IM4	test of insulation of one 4 wires point among all the others
DELTA	Resistance DELTA**,** During a **4M** test, compare DELTA of measures

PROGRAMMING OPTIONS (presented as standard only as a test between two points)

W	external output
O or S	operator ratification
I	display of test value
B	loop test
µ	detection of microcuts (continuity)

WAITING FOR EVENTS

PCe :	continuity event parameters (contact opening or closing)
Ce	waiting for contact opening
NCe	waiting for contact closing
PVCe :	voltage event parameters (appearance or disappearance of a voltage) (if voltage measuring option is present)
VCe	waiting for a voltage cut
NVCe	waiting for a voltage to be established

COMMODITIES

REM {text}	remark
H␣c␣t (text)	unconditional text (screen + printer)
HV␣c␣t (text)	unconditional text (screen)
HC␣c␣t (text)	conditional text linked to a faulty test
HCM␣c␣t (text)	conditional text linked to a faulty test
HCB␣c␣t (text)	conditional text linked to a correct test
HM␣c␣t (text)	typewriter mode
c	text colour (N black, B blue, R red)
t	character size (8 to 48)
H␣c␣t **(**text **& DIALn** text**)**	introduces the text of field n of the dialogue box (likewise for HV, HC, HCM, HCB, HM)
Y(text)	stop test
DEP: nnnnn	displaces the addresses of a file by nnnnn
HN	start of high-level test zone
BN	start of low-level test zone
GN	start of GO NO GO test zone
DELAI : nnnn	programs a delay time in ms
DIAL: program name	calls up a program of dialogue with the operator, *.DIA
NDIAL: program name	field of dialogue box is not visible in test report
MB (question**) (**reply **YES) (**reply **NO)**	calls up a dialogue box: reply with YES or NO and sends a text according to the reply.
CRT (file source) (file destination)	Test report in html format, use variable system
LOT() and **FLOT()**	lot management area
ECRAN (file path**)**	print on the screen, a HTML, JPG, TXT, or BMP file

CONDITIONAL JUMPS

SER and FSER	zone executed only in the first test
TESTB and FTEST	zone executed only if the preceding tests are all GOOD
TESTM and FTEST	zone executed only if the preceding tests are all BAD

LABEL(label name) **FINLABEL**

WAITING for an event

PCe:	Event parameters for continuity (relay open or close)
Ce:	waiting contact opening
NCe:	waiting contact closing
PVCe:	event parameters for voltage (voltage appears or disappears)
VCe	waiting for voltage shut down
NVCe:	waiting for voltage presence

CONTROLLER COMMANDS (if option present)

SE: n	command beginning of test if n at 1
SO1: n	set output n to 1
SO0: n	set output n to 0
SOM: n	n at 1 if one of the preceding tests is BAD
SOB: n	n at 1 if all the preceding tests are GOOD
SOC: n	n at 1 if all the preceding tests are BAD

STIMULI COMMANDS (if option present)

STIMULI	test zone using power supplies other than the measurement
FINSTIMULI	end of test zone using stimuli, general reset
PRESENCETENSION	zone disabling measurement if a voltage is present (replaced by STIMULI)
ARRETTENSION	end of PRESENCETENSION zone (replaced by FINSTIMULI)
usn␣ON	activation of stimuli power supply n (if option is present)
usn␣OFF	de-activation of stimuli power supply n (if option is present)
RO␣n␣xx	opening of relay xx in rack n
RF␣n␣xx	closing of relay xx in rack n
RP␣C␣n␣x	control of power supply x in rack n
RP␣A␣n␣x	shutdown of power supply x in rack n
RP680␣C␣x␣n	activation of stimuli power supply n in rack n
RP680␣A␣x␣n	de activation of stimuli power supply n in rack n
RF680␣x␣n A(..) B(..)	switch on power supply n between points A and B
RO680␣x␣n A(..) B(..)	switch off power supply n between points A and B
RX	reset of all relays (40680 and 40575)

EXTERNAL CONTROL (if option present):

PLE1: (1,2,3…)	control to 1 of outputs 1,2,3….
PLE0: (1,2,3…)	control to 0 of outputs 1,2,3….
PLEGL1	control to 1 of all outputs
PLEGL0	control to 0 of all outputs
PLEDELAI: nn	order delay after each control operation
PLECONST: < >	define a group of outputs for control
PLE1: < >	control to 1 of group defined in < >
PLE0: < >	control to 0 of group defined in < >

TEST WITH UNITARY RELAYS :

EIU	test between the others points (short-circuit+insulation+highpot+continuity)
EIUd	test between the others points (short-circuit+ highpot+continuity)
IU A( ) A( ) .	unitary insulation test between points A (hot point) and all other points
IU A( ) ……B( ) .	unitary insulation test between points A (hot point) et points B (0V)
IU A< > B< > .	unitary insulation test between nets A and nets B
JU	AC insulation test (same rules as code IU)

SYSTEM VARIABLE

&LABELn	show the n LABEL name
&DIALn	show the n field from dialogue box
&DATE	show date from computer
&FILE	show name of the test file

&RESULTAT	show GOOD or BAD test result
&RESLABELn	show result of LABELn

Test between 2 points show the number of good or bad test

&RS_I_	**&RS_CDEF_**	**&RS_R4_**	**&RS_FDEF_**	**&RS_ZL_**	**&RS_GMDEF_**	**&RS_GU_**
&RS_IDEF_	**&RS_NC_**	**&RS_R4DEF_**	**&RS_b_**	**&RS_ZLDEF_**	**&RS_VC_**	**&RS_GUDEF_**
&RS_NI_	**&RS_NCDEF_**	**&RS_d_**	**&RS_bDEF_**	**&RS_ZL_**	**&RS_VCDEF_**	**&RS_u_**
&RS_NIDEF_	**&RS_4_**	**&RS_dDEF_**	**&RS_LR_**	**&RS_ZLDEF_**	**&RS_VA_**	**&RS_uDEF_**
&RS_J_	**&RS_4DEF_**	**&RS_dz_**	**&RS_LRDEF_**	**&RS_ZC_**	**&RS_VADEF_**	**&RS_ue_**
&RS_JDEF_	**&RS_R_**	**&RS_dzDEF_**	**&RS_CR_**	**&RS_ZCDEF_**	**&RS_THTC_**	**&RS_ueDEF_**
&RS_C_	**&RS_RDEF_**	**&RS_F_**	**&RS_CRDEF_**	**&RS_GM_**	**&RS_THTCDEF_**	

Net tests

&RS_EQUI_	displays on screen the number of net
&RS_EQUIDEF_	displays on screen the number of failed net test
&RS_EQUICC_	displays on screen the number of net short circuit tested
&RS_EQUICCDEF_	displays on screen the number of net short circuit tested with fail result
&RS_EQUII_	displays on screen the number of net tested in insulation test
&RS_EQUIIDEF_	displays on screen the number of net tested in insultation test with fail result
&RS_EQUIJ_	displays on screen the number of net tested in AC hipot test
&RS_EQUIJDEF_	displays on screen the number of net tested in AC hipot test with fail result
&RS_EQUIC_	displays on screen the number of net tested in continuity test
&RS_EQUICDEF_	displays on screen the number of net tested in continuity test with fail result

SPECIFIC TEST

COMPARE	compare the result of the 2 last tests between 2 points
DECHARGE ON or OFF	discharge or stop the discharge of points after their test

COMMANDS FOR MULTIMETER AGILENT 34401 1 (if option is present)

PMVDC	DC voltage measurement parameters
MVDC	DC voltage measurement
PMVAC	AC voltage measurement parameters
MVAC	AC voltage measurement
PMIDC	DC current measurement parameters
MIDC	DC current measurement
PMR	resistance measurement parameters
MR	resistance measurement
PMR4	4 wires (Kelvin methode) resistance measurement parameters
MR4	4 wires (Kelvin methode) resistance measurement
PMP	period measurement parameters
MP	period measurement
PMVDC	parameters for DC current calculation based on a shunt
MVDC	DC current calculation based on a shunt
PMVAC	parameters for AC current calculation based on a shunt
MVAC	DC current calculation based on a shunt

COMMANDS FOR PICOAMMETER M1500P (if option is present)

PM1500P	M15000P parameters (threshold resistance + tension + time)
M1500P A(…) B(…) .	test M1500P between two points
M1500PM A(…)	test M1500P between A and all the others points
M1500PU A(…) …B(…) …) .	test M1500P between points A and the B points

COMMANDS FOR SEFELEC XS DIELECTROMETER

PXSI	XS insulation resistance parameter: U, maximum R threshold, minimum R threshold, T rise, T hold, T fall.

XSI A(….) B(….)	insulation XS test between two points
XSI_U A(….)... B(….) .	insulation XS test between group of points (see rule for group of point test)
PXSCM_V or PXSCM_O	Ground continuity parameters in Volt or Ohm : U, I, R low limit, R high limit, T rise, T hold, T fall
XSCM A(….) B(….)	XS ground continuity test between two points
PXSRA or **PXSRC**	XS **A**lternative or **C**ontinuous hipot parameter, U, I low leakage limit, I high leakage limit, Delta I, T rise, T hold, T fall
XSRA or **XSRC A(….) B(….)**	Hipot XS test - Alternative or Continuous – between 2 points
XSRA_U or **XSRC_U A(….).. B(….) ...**	Hipot XS test - Alternative or Continuous between group of points

D.IV TRANSCODING

The purpose of transcoding is to transform machine addresses (given by the tester output terminals) into user addresses. The operator is thus able to read the list of faults without having to refer to a table of correspondences, this tedious task being performed for him by the tester.

However, the programmer has to give the tester the information required to carry out this conversion.

An input help dialogue box enables the operator to enter these data without having to worry about syntax. The Editor is used for entering the data.

D.IV.1 THE PRINCIPLE

The tester must know, in tester point order:

- the names of the connectors (1 to 20 characters)
- the names of the connector pins (1 to 10 characters)
- the number of pins per connector

A set of points having the same characteristics is taken to constitute a connector. Non-wired points on the interfaces will be considered as connectors.

In order to simplify completion of the transcoding tables, connectors are classified by family or type of connector.

D.IV.2 DATA INPUT

For the method of operation, refer to the User's Manual (W420CH5).

Input of the data, in principle, consists in describing the connectors used by the technology of the equipment to be tested. A *.CNT file will contain the descriptions of the connectors previously grouped together by the user in a library (e.g. all the SUBD from 9 to 50 pins). These libraries, stored on the hard disk, can be used for several programs. Incidentally, it is useful early on to create the libraries necessary to describe all the technology of a product.

Once the connectors have been entered, all that is needed is to give the correspondences between tester points and equipment points. If tester points are not connected to the equipment, it is superfluous to give them a name. The corresponding box can just be left blank.

In the input grid for the table of correspondences, an interface column is interposed between the machine points and the user points. It can be used to compose the program, using the interface as a reference, and thus ignoring the tester. The table of correspondences will then be written by inserting the connectors one by one as they are connected to the tester.

D.V FORMAT OF THE PROGRAM FILE

In order to function, the tester needs several working files, in which all the information for a set of tests is provided.

The name of each of these files is made up of not more than 31 alphanumerical characters and an extension of 3 characters, imposed by the tester software in accordance with the description above.

The name of a test program will be written in the form *.TES.

D.V.1 CONNECTOR TABLE (*.CNT)

The connector table (*.CNT) is a text file in which each record corresponds to a connector, and is made up as follows:

{ name_of_connector ↵
  name_of_pin↵
  y_ of_pin ↵
}
where the opening curly bracket represents the beginning of a record, and therefore of a connector. The name of the connector is made up of 30 characters, and must be followed by a line ending (LF CR). The names of pins must be made up of 10 characters, and must be followed by a line ending (LF CR). The maximum number of pins is limited to 1000 A record must be terminated with a closing curly bracket. The number of connectors contained in a file is unlimited.

D.V.2 ERROR REPORT (*.ERR)

The error report (*.ERR) is a text file. It can be consulted using any word processing program.

D.V.3 TEST REPORT (*.RES)

The test report (*.RES) is a file of type RTF. It can be consulted using any word processing program.

D.V.4 TEST PROGRAM (*.TES)

The test program in user points (*.TES) is a text type file. It can be generated on any kind of equipment, and can be modified by any word processing program.

D.V.5 TABLE OF CORRESPONDENCES (*.COR)

The table of correspondences (*.COR) is a text type file. it can be generated on any kind of equipment, and can be modified by any word processing program.

Warning: *use of the editor takes into account the configuration of the tester (number of points and position of the high voltage or low voltage modules). It is therefore necessary to open the tester function (see ch. II-1) before any programming operation.*

E. OPERATING INSTRUCTIONS

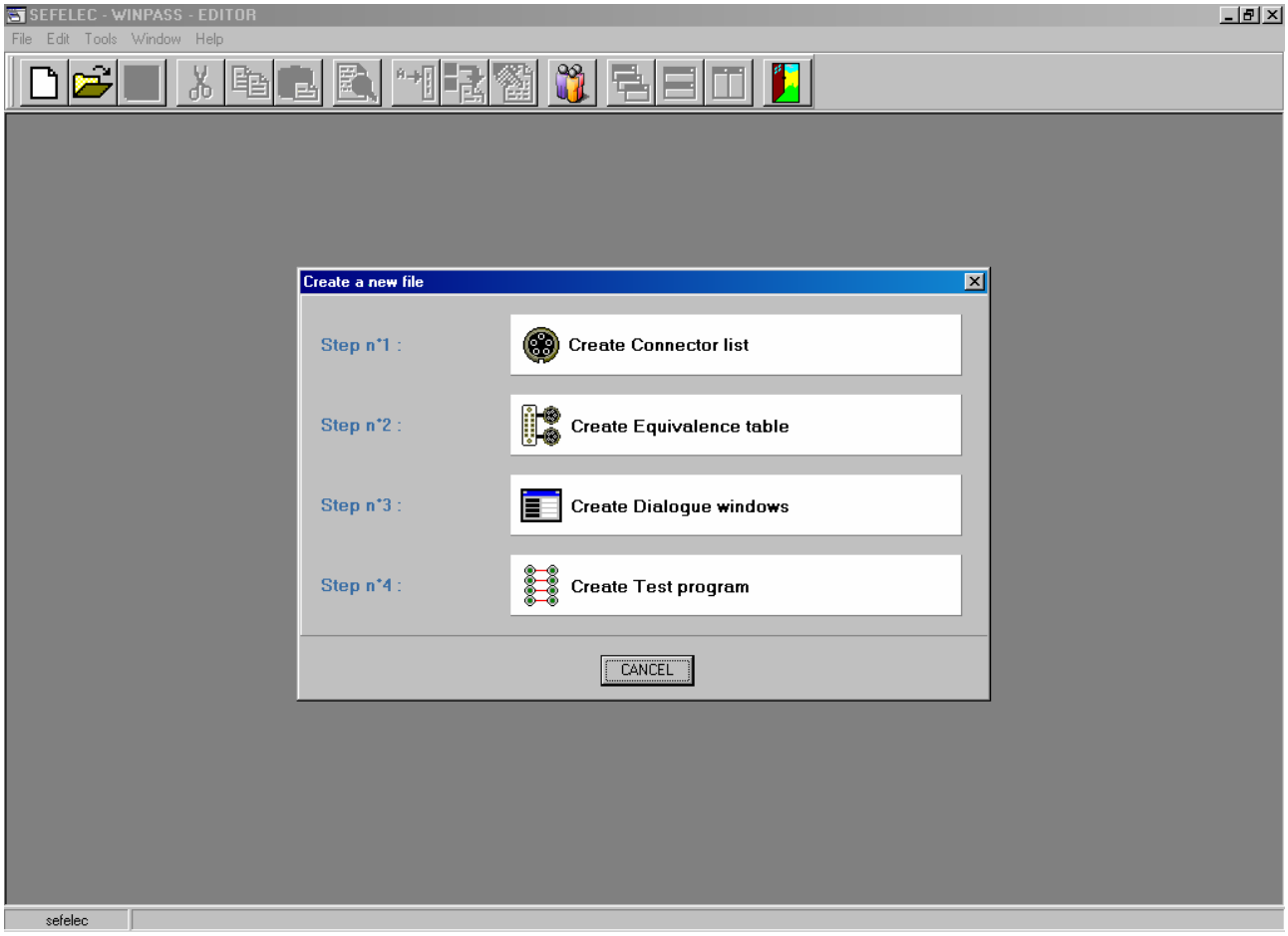
Warning: *The use of the editor takes into account the tester configuration (number of points and position of the high voltage and low voltage modules) You must therefore go into the* ***configuration*** *function before any programming.*

E.I Editor

In the installation instructions, we shall describe all the functions of the two parts of the WINPASS software. The first part will deal with the Editor, which will provide the opportunity to compose a program. The second part will describe the operation of the tester.

Everything that follows is based on the supposition that the user is familiar with the basics of the Microsoft WINDOWS operating system. If this is not the case, it is essential to study the instructions for use described with that software.

When creating a new test file, after clicking on the blank page, the screen proposes a logical sequence to assist preparation of the information to be entered in the tester.



E.I.1 PASSWORDS

The following functions are controlled by password:

Access to the editor

Access to the tester

Access to the test configuration

Access to self learning

Use of the self test without parameter changes

Access to manual mode

Use of stop on fault without changing the parameters, measurement or points

The administrator has all rights: access to names, passwords and choice of user rights

Users do not have access to the control panel. They must enter their name and password to access protected functions.

User names and passwords are limited to 16 characters.

In the basic tester configuration, this function can be disabled (only by a SEFELEC technician).

By default, when the WINPASS software is first installed, the user is SEFELEC and the password is SEFELEC.

E.I.2 CREATION OF CONNECTOR TABLES

In the following pages, we shall describe a library of two connectors, by way of example. The first will be a 25-point connector with numerical pins, the second a 50-point connector with alphanumerical pins of types (A, B, C,…aa, ab, ac, …,ba, bb, …., be).

To do this, open the Editor and carry out the operations below.

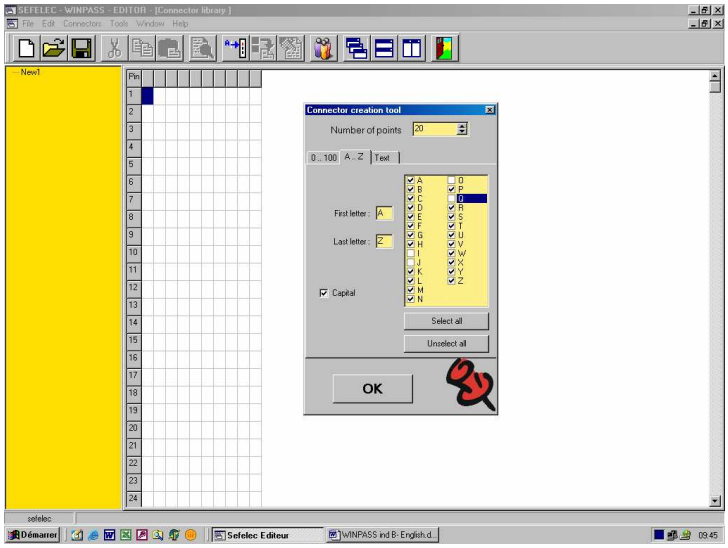
In the menu of the Editor, open the connector table:

FILE

NEW

In the dialogue box, click on CONNECTOR.

The window contains a column in which we shall enter the names of the different connectors in the library. In the grid on the right, we shall describe the pins of these different connectors.



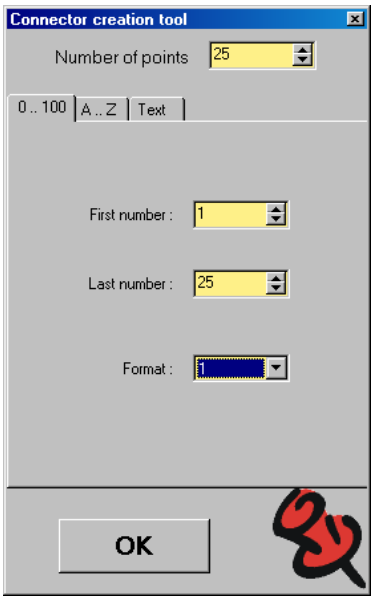
E.I.2.1 Creation of connector tables

To create the first connector:

Click on NEW1, then on CONNECTOR TYPE

Click on RENAME

Type CONNECTOR1, for example, to name the type of connector to be described. Validate by pressing ENTER.



Click on TOOLS then on DEFINE CONNECTOR. Drag the window DEFINE CNT to the right to uncover the grid for creation of the pins.

Then click on the tab 0…100 in order to describe the numerical pins of CONNECTOR 1.

In NUMBER OF POINTS, give the total number of pins of the connector that is 25.

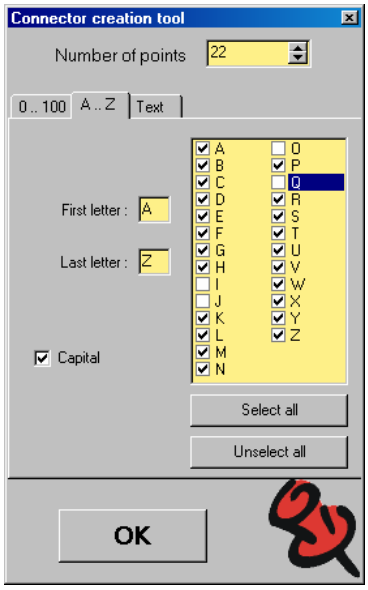
When the box DEFINE CNT is completed correctly, click on Ok. This operation completes the grid of the pins of CONNECTOR 1.

E.I.2.2 Creating an alphanumerical connector

To define the second connector, as described at the start, click on CONNECTOR TYPE and on NEW, then on RENAME. On the keyboard, type out the name of the new connector to be described. It will be CONNECTOR 2 in our example.

With the box DEFINE CNT still open, click on tab A..Z

Enter the number of points: 22, which will enable us to describe the first 22 pins in capital letters.



Since the first pins are in capital letters, tick the box UPPER CASE ☑.

The letters designating the pins do not include the letters I, J, O and Q. Deselect the four letters excluded: their boxes must be empty ☐.

Click on Ok to complete the first 22 boxes in the grid.

Each of the following pins has two characters in its name. Both columns must be completed. The first column contains the letter "a" 23 times. The second contains all the letters, in alphabetical order, except l, o, q, i.e. 23 letters.

In the grid, click in the box on the left, under the Z. In the box DEFINE CNT, click on upper case ☐ to change to lower case. Then, in MIN, type A, and do the same in MAX. Click on the letter A ☑ and mark 23 in NUMBER OF POINTS.

Click on Ok, and the first column will fill up with 23 "a"s.

Click in the second box next to the first "a", and in the list of letters in the box DEFINE CNT click on l, o, q ☐. In Max enter Z and click on Ok.

The pins designated by two characters are now defined.

As the connector has 50 pins, the 5 pins ba, bb, bc , bd, and be still remain to be described.

Repeat the same operation as the last time, but this time type 5 in NUMBER OF POINTS and "b" in MIN and MAX for the first column. For the second column, put "e" in MAX.

To re-read each list of pins for verification, just click on CONNECTOR 1 or CONNECTOR 2.

Before quitting, save your data with:

FILE

SAVE AS

In our example, we shall call this file "CONNECTOR", and we will place it in WINPASS\PRG or the work directory selected by the user.

E.I.3 CREATING THE EQUIVALENCE TABLE

Having defined the connectors used in the equipment to be tested, we now need to describe the correspondences between the tester outputs and the points on the equipment. This operation is equivalent to describing the interface between tester and equipment under test.

To create a table of correspondences, select:

FILE

NEW

EQUIVALENCE TABLE

The window shows one column headed "MACHINE" which gives the tester points in decimal. The second, "INTERFACE", gives the name corresponding to the points of the intermediate interface. The third, "USER", will contain the names of the access points of the equipment to be tested.

The connectors programmed can be called up using the left-hand part of the screen.

To write this table, the programming tool INSERT CONNECTOR must be used.

This tool is used to choose the library and the names of the connectors to be inserted in order to create the table.

E.I.3.1 Description of the interface

The interface in our example is made up of three connectors which we shall call P1, P2 and TB1.

P1 is a connector of 25 numerical pins described in the CONNECTOR library under the name CONNECTOR1. Its first pin is connected to point 1 of the tester.

P2 is a connector of 50 alphanumerical pins described in the CONNECTOR library under the name CONNECTOR2. Its first pin is connected to point 32 of the tester.

TB1 is a connector of 25 numerical pins described in the CONNECTOR library under the name CONNECTOR1. Its first pin is connected to point 97 of the tester.

On the tester, the wiring to be tested will therefore occupy connectors C1 to C4, that is to say 128 points at 500V.

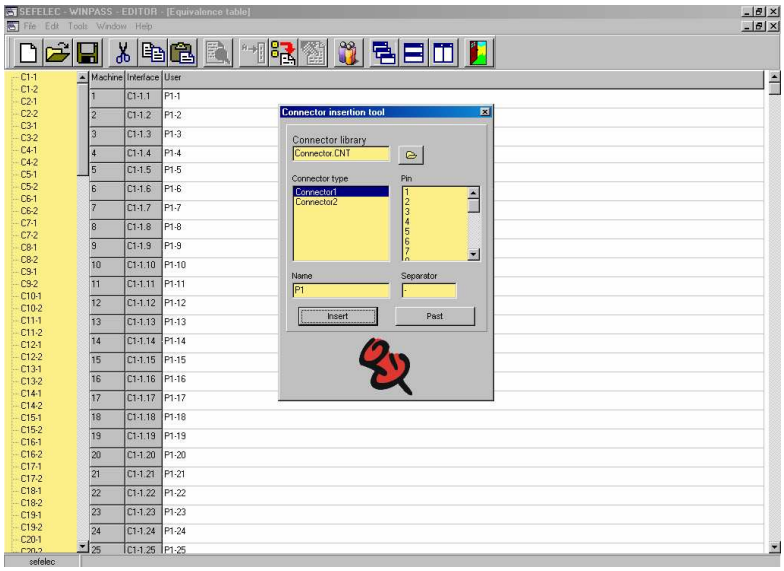
For convenience of wiring, each connector begins at the start of a tester output connector, which will leave "gaps" in the table of correspondences. These gaps in the tester represent points which have not been allocated, so that there will be no description (an empty box) opposite these points.

E.I.3.2 Completing the equivalence table

Click in the User column against machine point 1. Call up the programming tool: INSERT CONNECTOR. Drag the dialogue box to the right-hand side of the screen and click in the LIBRARY window to call up the CONNECTOR library in which we stored the connectors of this wiring system.

Click on CONNECTOR1, and in the window NAME give the name of the connector of the wiring system, P1 in our example. If necessary, choose a separator between name of connector and pins, then click on INSERT.

The first 25 points are defined automatically.



To enter P2, click on point 32 and in the box INSERT CONNECTOR click on CONNECTOR2. Type P2 in the window NAME then click on INSERT. The 50 tester points from 32 to 82 are then defined.

For the connector TB1, repeat the same operation, starting from machine point 97, so that the points from 97 to 121 are defined.

The transcoding table is now complete. All that remains to be done is to save it, using SAVE AS; the name of our table for this example will be TRANSCO.

E.I.4 USER DIALOGUE BOX

When a test is run, a user dialogue box can display a window inviting the operator to enter the data concerning the wiring system to be tested.

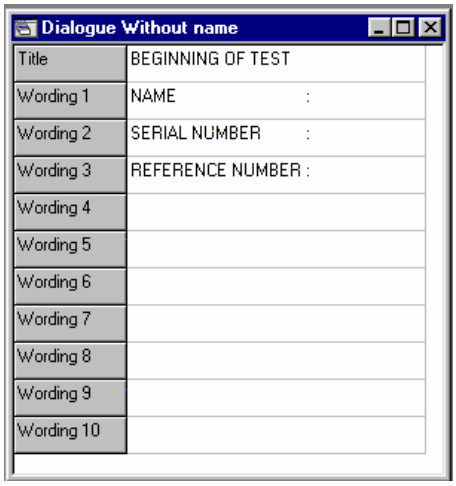
To create a box, click on:

FILE

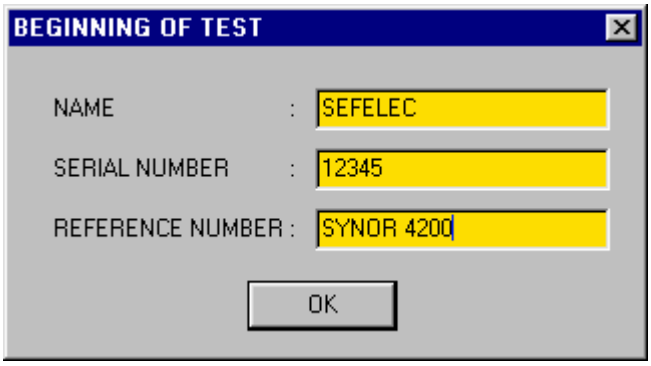
NEW

DIALOGUE

The window displays a page in which to enter the title and designations of the fields to be completed. After completing the box, save it by giving it a name. This name will be repeated in the test file associated with the instruction DIAL.



Example: The file is named DIALOGUE1.DIA
In the test program, write:
DIAL: DIALOGUE.DIA



In this example, the dialogue box displayed during the test will be:

The designations can be used to complete the name of the test results file (see II- 1 - 2 Test configuration).

Should the user fail to fill in a field, the dialogue box indicates the fact. The test will not be performed until all the fields have been filled in.

E.I.5 COMPLETING THE TEST FILE

To complete the test file click on:

FILE
NEW
TEST PROGRAM

The window displays a page containing lines on which we shall write the test program. Writing can be done in two ways:

- by direct entry, respecting the syntax described in the programming instructions
- by using the programming tool.

In the example below, we shall not discuss the first method, but will use the programming tool by selecting:

TOOLS
TEST TOOLS

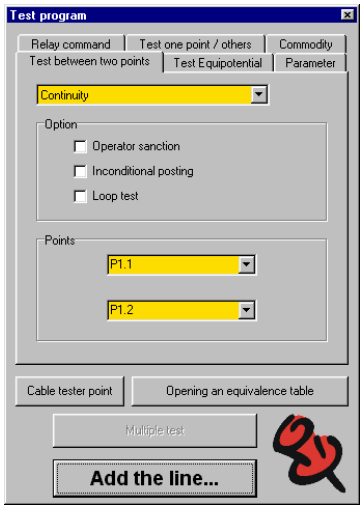
This box contains the following tabs:

- Test between two points
- Equipment
- Parameters
- Multiple test
- Control of relays (option)

The principle, for the first two headings, consists in giving the type of test and the points to be tested. The third is used to program the parameters associated with the tests. When the test tool box is correctly completed, validating it writes a line on the screen in tester syntax.

E.I.5.1 Test between two points

The test between two points enables testing of all components, as opposed to the net test, which is restricted to wires.



In the top window choose from the list of tests:

- Continuity
- Non-continuity
- Continuity 4 wires
- Insulation continuity
- Insulation, alternating current
- Resistance
- Diode
- Condenser
- Shielding
- Self-inductance
- Condenser, alternating current

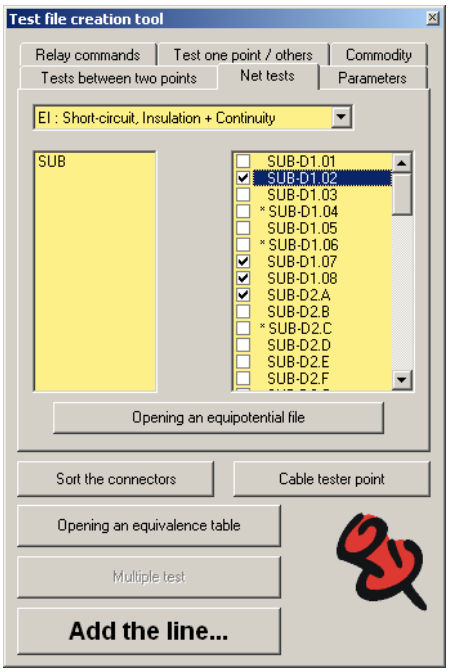
Then choose the test options by tick the boxes ☑.

Finally, specify the two points to be tested by choosing them from the list called up in the table of correspondences of the wiring system to be tested (click on CORRESPONDENCES).

***Note**: some of tests proposed are only available if the options are present*

E.I.5.2 Net test

To create a test net between more than 2 points, select the command code :



- High voltage insulation test and continuity (EI)
- Alternative high voltage insulation test and continuity (EJ)
- Low voltage short circuit test and continuity (ED)
- Continuity test on the net (EN)

Next step is to select the different points of the net, tick the box ☑ near the point. Points marked with * are points which are already used in the program, it's only an information, you could select this point more than once if needed.

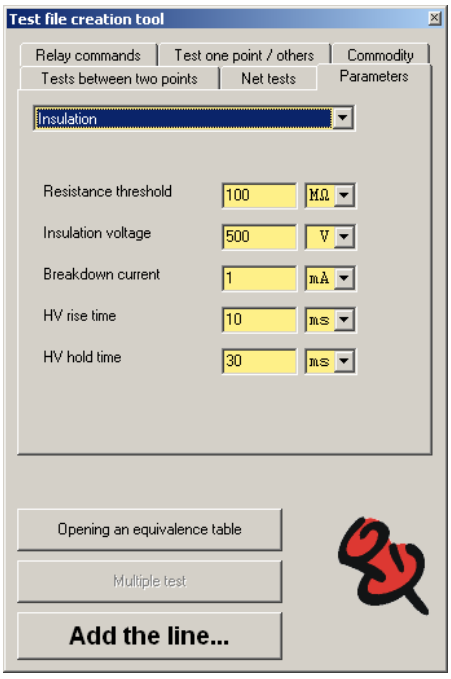
As explained in previous chapter, the name of the point must be transcoded from equivalence table. In this case select "OPENING AN EQUIVALENCE TABLE". For long list it's possible to sort the connectors in alphabetic order, select "SORT THE CONNECTORS"

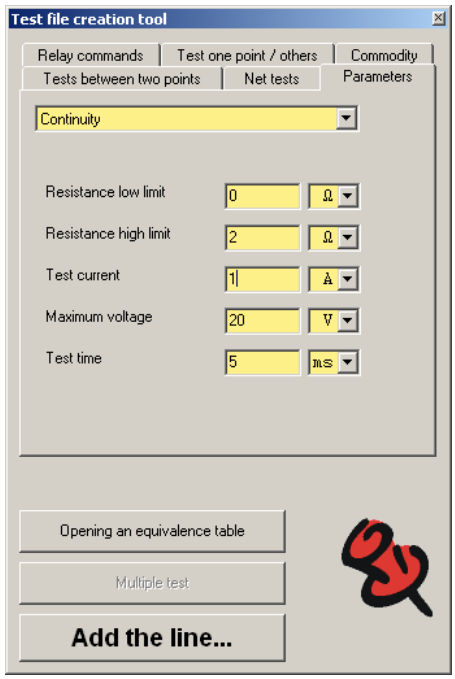
E.I.5.3 Example

The example described below, use all the step described in this chapter, creating connector, creating equivalence table and use some net test and some components test.

The first net is testing with the following parameters, insulation 500V, hold time 100ms, rise time 10ms. The breakdown current is 1mA, and the resistance threshold is 100MΩ. The net is made from two points linking by a wire which has a resistance value less than 2Ω. The test current used for this test is 1A.

P1.1 ——— **P1.3**





First step in EDITOR

FILE

NEW

CREATE TEST PROGRAM

Now on the screen we can add the different instruction to create the testing program. To help us we use the test file creation tool, select

TOOL

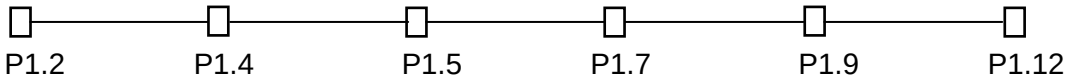
TEST FILE CREATION TOOL

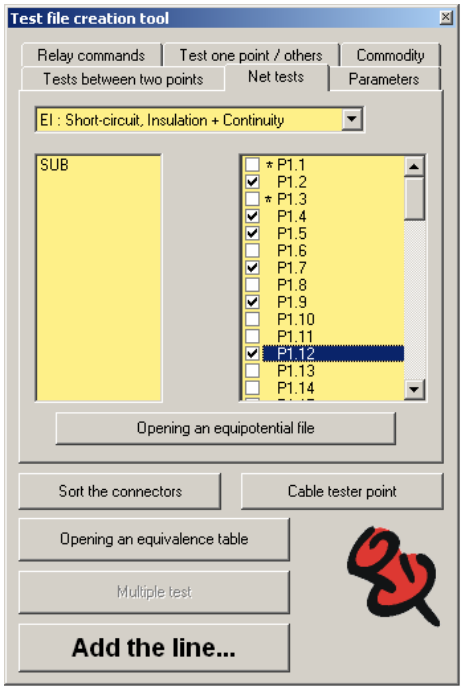
Now select PARAMETERS and INSULATION. Complete parameters as described in picture upside, select ADD THE LINE to create the command code in the program

In the same dialogue box in PARAMETERS, select CONTINUITY. Complete parameters as described in picture upside, like insulation parameter, select ADD THE LINE to create the corresponding command code

Now parameters have been created. From TEST FILE CREATION TOOL, select net tests, and tick the box P1.1 and P1.3. To have points name from equivalence table. Select OPENING AN EQUIVALENCE TABLE and choose the file TRANSCO.COR

The second net is as described below with the same parameters





You don't need to write parameters, program will use those writing before.

For second net, tick the boxes for each point as the picture. There is a star * in front of P1.1 and P1.3 because they are already use in a net.

In a full program, you need to describe every points for safety reason. So at the end every point will have this star in this dialogue box. Select Add the line to create the corresponding command.

To finish this program file, we will create a component test : one 10 Ω resistance between points P1.6 and P1.10

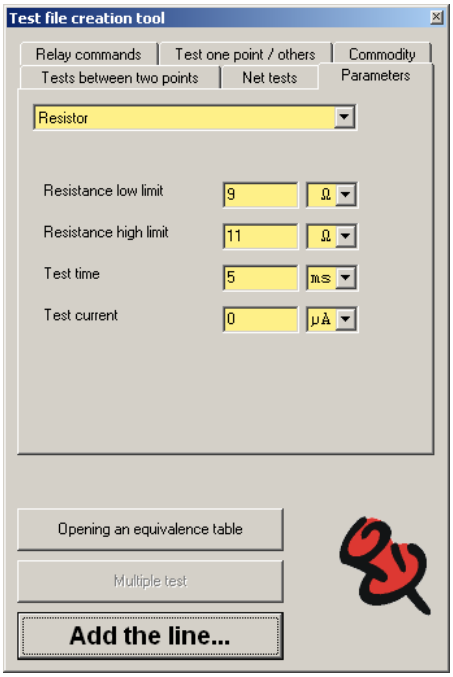
First step, we need to describe resistance parameter. Until now, we only create parameters for continuity and insulation to test nets.

In TEST FILE CREATION TOOL, select PARAMETERS and then RESISTOR.

Complete parameters as the picture beside. We only need to have minimum and maximum resistance value, we choose for the 10 Ω resistance, a limit between 9 and 11 Ohm.

An adjustable hold time is convenient when capacitive components are present. An adapted hold time has to be choosen in order to charge the parasite capacitor. Here we choose a 5ms test time.

The test current is programmed at 0, in order to indicate that the tester is working in automatic ranging.



Still in TEST FILE CREATION TOOL, select TESTS BETWEEN TWO POINTS, to program resistance point test.

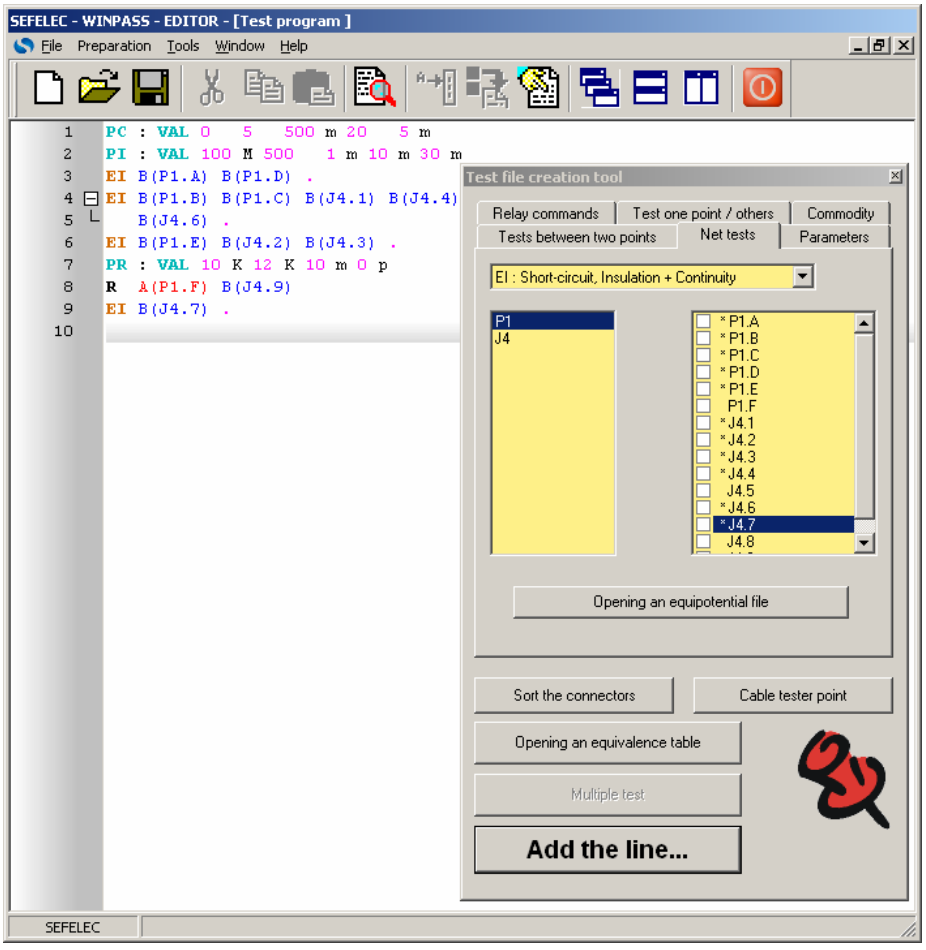
at the end program must be as mentioned below

To check this program, select :

PRÉPARATION

SYNTAX CHECKING

The message CHECKING FINISHED means the program is validated. We can save it and use TESTER mode to check the cabling of this program.



E.I.6 A FEW LITTLE EXTRAS

E.I.6.1 Graphic display of a test file

This function is used to display and print out test programs, with each test represented by a graphic simulating either a net or a component. The type of test and point addresses are given.

E.I.6.2 Another solution for the parameters (applicable to older versions using DOS)

It is possible to record the test parameters in a table. This table will contain 100 lists of values for each type of measurement. Once these lists have been completed, they can be called up from the test file by a simple code: PI: 5. this means that for the measurements to follow, the DC insulation parameters will be those given in list no. 5 of the table of parameters.

To complete this table, select:

TOOLS

LIBRARY OF PARAMETERS

This method has the advantage of simplifying definition, but the disadvantage of assigning the parameters to the tester and not to the test file. This can also be inconvenient if the file is used on another tester.

Note: *The particular advantage if this method is its compatibility with older systems operating on DOS (SYNOR 3400, SYNOR 9400, etc.).*

E.I.6.3 MESSAGES

Since messages have no programming tool, just click on the line of the program and type the message on the keyboard, respecting the syntax, for example:

H (start of test) or HV (end of test)

E.I.6.4 Controller commands

The controller commands can be written with the test tool:

TOOL

TEST TOOL

In the test tool, click on tab CMD RELAY It is then possible in the Rack in question either to direct or deactivate the power supplies, or to control the relays.

Note: *do not forget to perform a zero reset at end of program.*

E.II The tester

E.II.1 CONFIGURATION

In the operation of the tester two configurations must be distinguished:

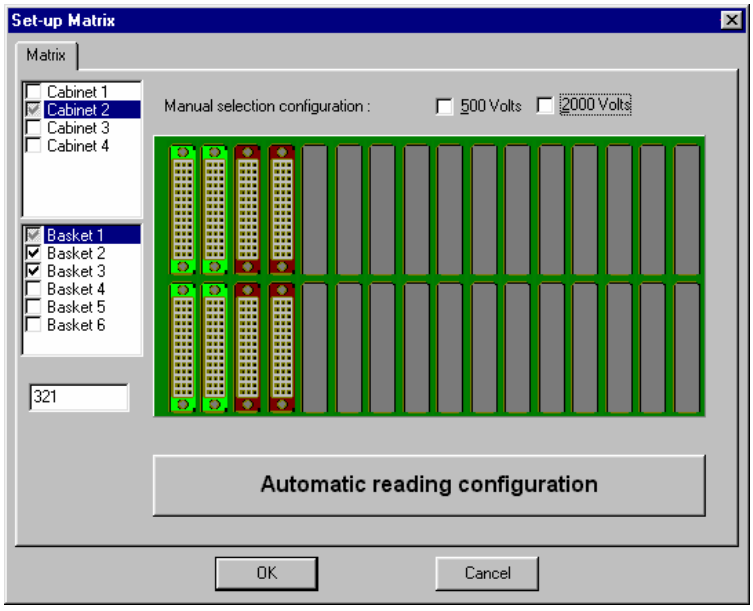
- machine configuration
- test configuration

E.II.1.1 Machine configuration

This depends on the electronic structure of the tester.

It is entered once and for all, unless new multiplex cards or options are added.

Click on to configure the machine.



Two solutions are available:

1 – Manual method:

Here we shall declare the position and number of modules of access to the points of the tester. Two types of modules are available: 500 V and 2000 V.

To mark a module, give the number of the cabinet and the number of the back panel. Click on the box corresponding to the voltage ☑ . Then click on the box corresponding to the physical position of the module in the tester.

The 500 V modules will be indicated in green and the 2000 V modules in red. The read-out button will automatically determine the configuration of the selected back panel (this function is only available when the tester is switched on).

The automatic search takes several seconds. Once complete, the screen displays the number of racks in each cabinet, and the position of the cards in each rack.

The total number of test points is displayed at the bottom left.

On modernized testers (former tester SYNOR 3400)

Switching cards fitted with FRB 102-pin connectors are not designed to be recognised by the tester and mixing is not possible. In this configuration the screen does not therefore ask for the total number of points.

2 – Automatic method:

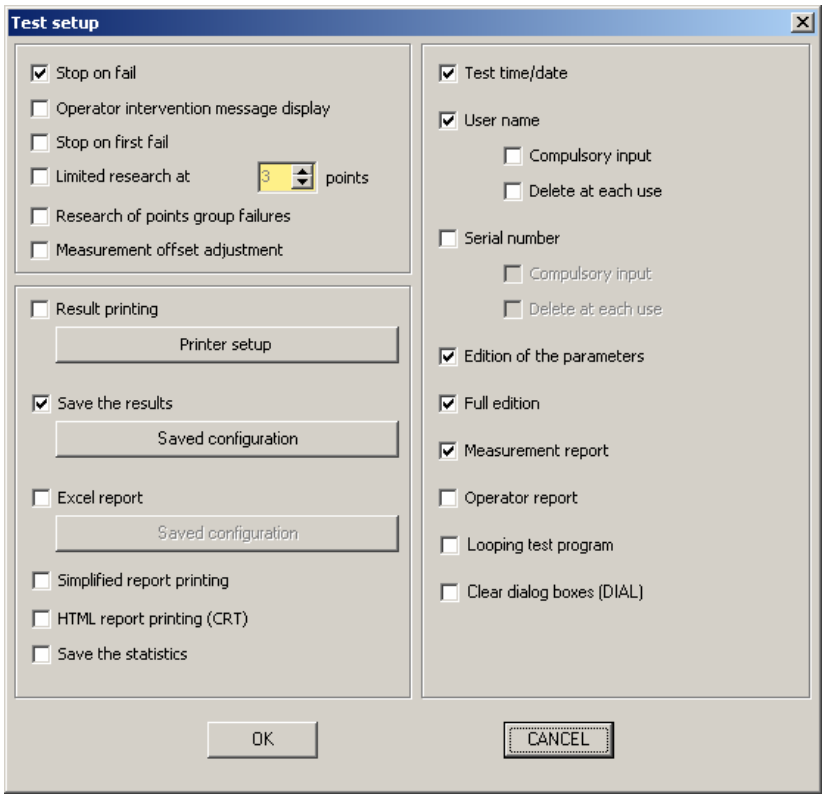
With the tester switched on, just click on the button AUTOMATIC CONFIGURATION READ-OUT.

E.II.1.2 Test setup

Unlike the machine configuration, test configuration can be changed at any time. It is a set of tools facilitating the use of the tester to carry out tests.

Using the icon at the bottom right of the test screen, access can be had to this box during the test and the contents can be modified.

It is the usual principle: the function is activated by the presence of ☑.



Panel at top left: test conditions

- **STOP ON FAIL:** in the event of a test fault, gives access to a control box which will define the problem or correct it immediately.

- **OPERATOR INTERVENTION MESSAGE DISPLAY**: write a message in a test result in the event of the operator stop the test with or do a manual action before the end of the test

- **STOP ON FIRST FAIL:** the test is stopped and moved on to the next test as soon as a fault appears.

- **LIMITED RESEARCH:** where there is an insulation fault with a large number of points, it is possible to limit the search for points to a number defined in the window on the right. In the error list, the indication LIMITED SEARCH is shown.

- **MEASUREMENT OFFSET ADJUSTEMENT:** the tester is capable of measuring its own internal resistance and of bringing it down to the level of measurements of low resistance in continuity and resistance measurements.

Panel on the right: configuration of the print-out of the results

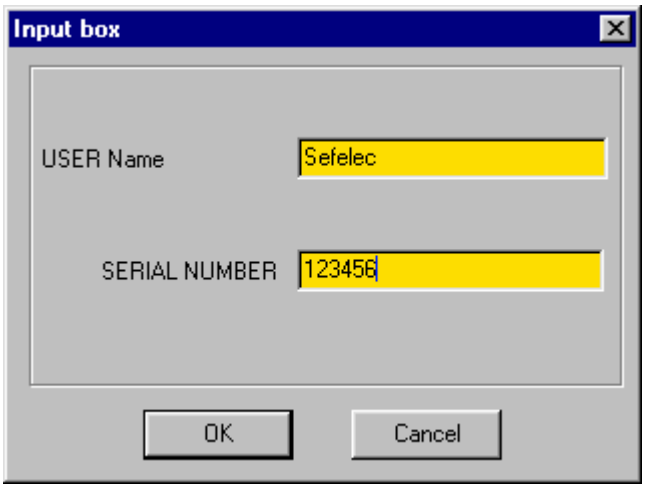
- **TEST TIME DATE:** marks the date and time of the test.

- **USERNAME:** to enter the name of the operator at start of test.

  - **Obligatory field,** as its name suggest, makes it obligatory to complete the Operator's name field. This option does not allow for validation of one name among others.

- **SERIAL NO:** to enter a serial number at start of test.

  - **Obligatory field** makes it obligatory to enter the serial number of the assembly to be tested. This option checks that the serial number field is not empty, but does not verify the coherence of the number.



- **Edition of the parameters:** as soon as the tester encounters a parameter instruction, (see programming instructions Ch. II-3-2-3) it displays the results of the parameter encountered in clear on the screen and in the listing.

- **FULL EDITION:** used to display all the measurements, whatever the result of the test (good or bad). In the list of results, the word "fault" is nevertheless clearly shown.

• **MEASUREMENT REPORT:** at the end of the test, displays the total of measurements taken and the number of faults for each type of measurement.

• **OPERATOR REPORT:** displays a screen at the end of the test to enter comments.

• **LOOPING TEST PROGRAM**: at the end of program, restart it automatically, you need to stop it with manual action on “STOP” button.

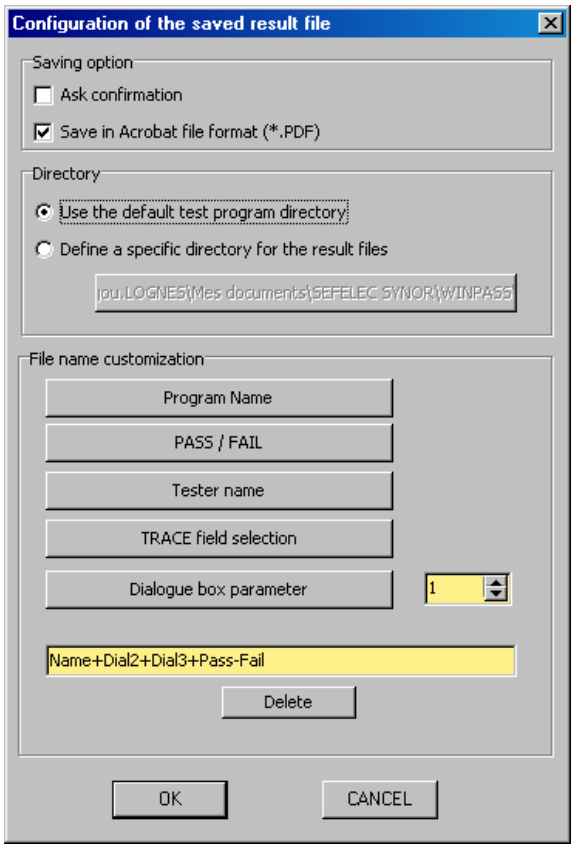
• **CLEAR DIALOGUE BOXES**: reset dialogue boxes, every time we execute the *.TES program

Panel at bottom left:

• **RESULT PRINTING:** the results are sent to the printer. Select “printer setup” to set the different parameters of the printer

• **SAVE THE RESULTS:**

The results are recorded at the end of each test in a TES file. Select “Saved configuration” for the configuration of the saved result file



Ask confirmation: the results are only recorded after confirmation by the operator.

Save in Acrobat file format (*.pdf), adding to TES file, the same file will be created to pdf format

• **Directory:** Two solutions are proposed:

1 - The result files are always recorded automatically in a directory bearing the three letters RES plus the name of the test program whose execution they represent. The directory is created automatically if it does not already exist.

By default, the directory designed to contain the result files is situated in the same place as the test program which gave rise to it.

2 - An option enables the operator to define a directory which will contain all the directories of result files defined above; this option enables the result files to be separated from the test programs.

• **FILE NAME CUSTOMIZATION:** The name of the file by default is the name of the test. It is possible add in the name of the result file characters by which it can easily be identified in a list, tester name (if a name had be given to the tester), TRACE field if the option TRACE is used in test file, dialogue box field complete during the test (if a dialogue box had been created in test file) move up or down to select the number of the dialogue box field you choose.

To delete the structure of the name: - click on the button Delete,
- click on 'Name of program' to add the name
- click on 'Parameter (Dialogue)' to add text from the user dialogue box (the number corresponds to the number of the designation to use).

Example:

Name of test file 'DEMO.TES'
Configuration = 'Name' Name of result file = 'DEMO.RES'
Configuration = 'Name+Dial2' Name of result file = 'DEMO101.RES'

bearing in mind that in the dialogue box called up by **DIAL** in the test program, the designation 2 requests the serial number and received the reply: 101.

• **SIMPLIFIED REPORT PRINTING:** prints a report at the end of the test with the date, the name of the operator, the serial number, the total faults and the operator's report.

• **SAVE THE STATISTICS:** Records the date, the name of the operator, the serial number, the total faults in a common file for all tests bearing the same reference.

For use of this option, see chapter "I – 3 User dialogue box".

E.II.2 SELF TEST

A tester is a device whose purpose is to check the quality of the wiring system of a product. It cannot yield a reliable diagnosis unless its own wiring is faultless. For this reason, it is necessary always to self test the apparatus before using it (see General Description).

The self test can be accessed by selecting:

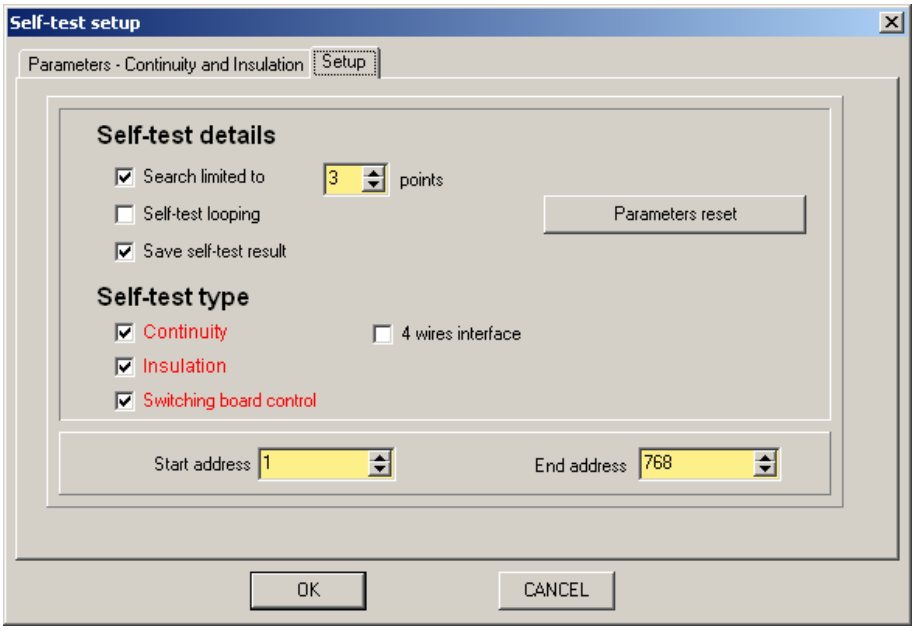
MENU

SELF TEST or clicking on the button

This dialogue box enables you to configure your self test. It is made up of a number of pages which will appear as a function of the configuration of the machine (Options).

The first page gives you the opportunity to carry out the general settings of your self test.

The choice of self test types is a function of the options of your tester.



After choosing the general settings, you will need to parameterize the values of the different measurements which will go to make up your self test:

The parameters selected will be the strictest possible, in order to ensure that the tester does not bias the measurements on the wiring through its own characteristics.

By way of example, the settings of the parameters for continuity and insulation are shown below.

The self test parameters are automatically saved and proposed afresh after any stoppage of WINPASS. There is an icon to return to the factory parameters.

NOTA : in Set-up “loop self test” is recommended to heat progressively the electronic of the tester. This function is efficient when a tester doesn’t reach insulation resistance threshold because of high humidity or long shutdown.

E.II.3 SELF LEARNING

Self learning is used to create a test file on the basis of a wiring system taken as representative. This operation is only possible when the equipment to be tested can be connected to the tester, so the interface is created and the table of correspondences is written.

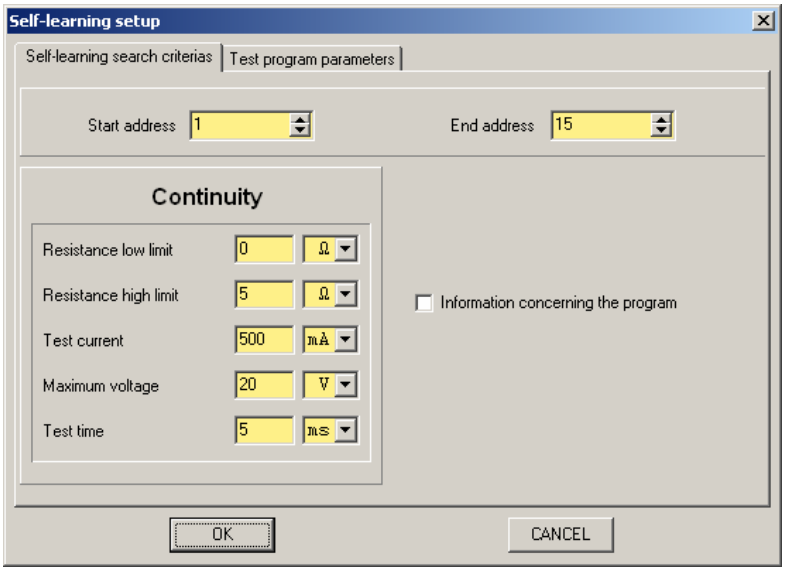
To start self learning select:

MENU

SELF LEARNING or the icon

Before conducting any operation, connect the equipment for the self learning to the tester.

The first dialogue box requests the table of correspondences. This may have a name different from the test file.



After validation, the second box requests the parameters to be used in the test file. At the bottom of this box, enter the addresses of the start and finish of the exploration. These addresses comprise the first and last point connected to the tester, even if this point is isolated.

Validation of this box initiates exploration of the wiring system. This is displayed on the screen by the writing of the test file step by step as the tester creates the nets.

Once self learning is complete, the program can be used immediately for tests. This operation is an excellent way of confirming that the self learning process has bee carried out properly.

WARNING: *an autoprogram can only be validated if the listing of the test program is compared with the wiring system document, which remains the sole standard of reference.*

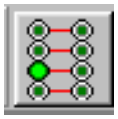
After self learning it is essential to go back to the EDITOR to insert the texts giving instructions to the operator or constituting the verification report.

WARNING: during self learning, all other functions (machine configuration, probes and manual mode) are invalidated, for security reasons.

E.II.4 TESTING

Once the program has been drawn up, either by self learning or by input using the editor, the wiring system must be tested by the test function, accessible by selecting:

MENU

TEST or the icon 

The dialogue box requests the name of the test program. After the program is validated, the bottom of the window indicates the start of the program. This window scrolls during the test to display its progression.

To start the test, click on the icon:

If STEP BY STEP execution of the program is required, click on the icon:

To stop the test without quitting the function, click on the icon:

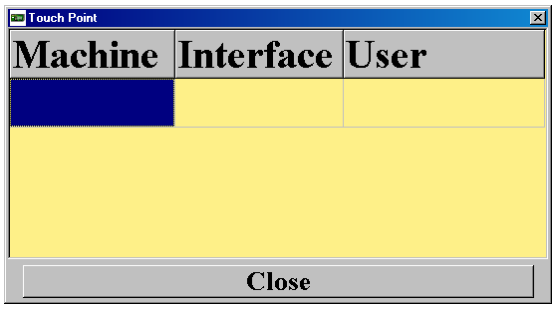
To modify the test configuration, click on the icon:

For this last function, see chapter on configuration.

During the test, it is possible to modify the configuration. The probe and manual mode are accessible via stop on fault. At the end of a test, it is possible to "retest" the equipment connected. In this case, the test window is not refreshed. Preceding tests can be scanned using the scroll box. On the request "Quit", the window is refreshed but the test file remains open. To change files test click on the Close icon.

E.II.4.1 PROBES

To obtain this function click on the icon:



This function induces automatic scanning of the switching matrix, and contact of the probe (accessible on the front panel) with any one of the points of the wiring system to be tested gives the address in user points and in tester points.

This function is extremely useful for clearing breakdowns of the wiring system during the test, or of the interface.

***WARNING**: for reasons of safety regarding the equipment to be tested, the probe is only accessible from the initial menu and the stop on fault.*

E.II.4.2 MANUAL MODE

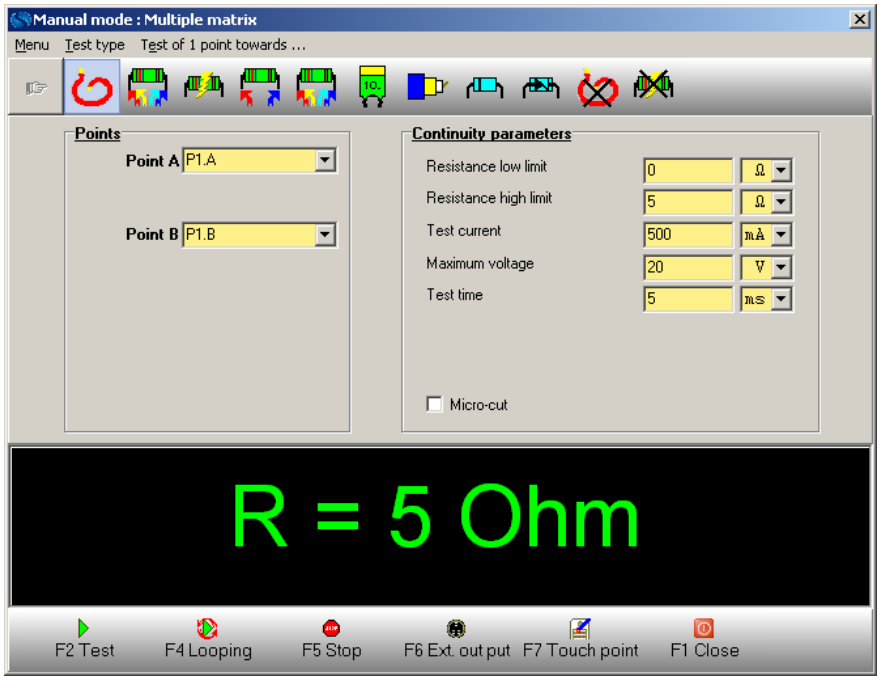
To obtain this function click on the icon:

This function gives access to measurement of the tester. For security reasons, this function is only accessible from the initial menu and stop on fault mode. Using this, it is possible to quit the test in progress while retaining its environment. However, while MANUAL MODE is in use, it is possible to carry out measurements on demand using parameters other than those of the test file.

This function is primarily an aid to the constitution of a program and to the choice of the most specific test parameters.

The dialogue box below gives a toolbar offering a choice of available measurements.

The right-hand window is used to choose the points to be tested. The left-hand window gives access to the choice of the parameters of the test to be performed.



Finally, the control bar at the bottom of the window enables the operator to start the test, loop it and stop it. Access to the probe and the external output is always possible from this function bar.

Finally, the result of the measurement is displayed in large characters in the middle of the window.

Return to the test by clicking on the icon:

E.II.4.3 Execute a test file part

It is possible to execute only part of a test file. To select this, click on:

CONFIGURATION

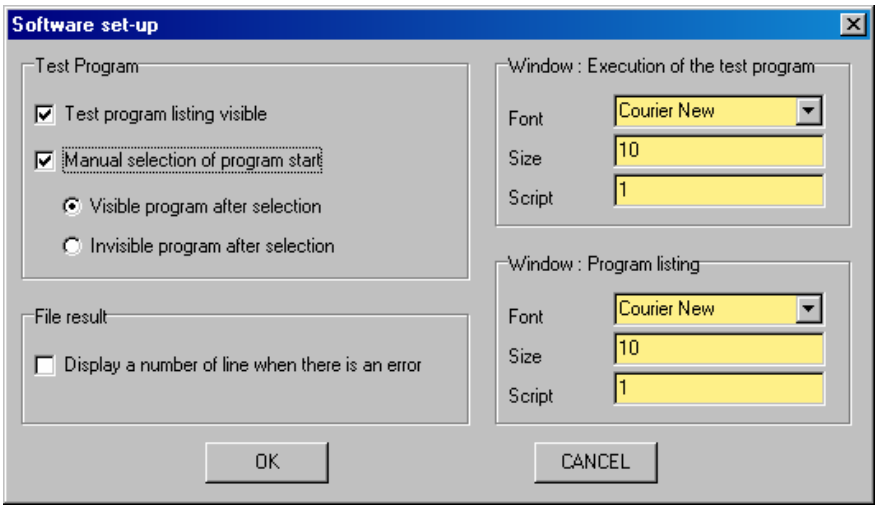
SOFTWARE CONFIGURATION

Select TEST PROGRAM LIST VISIBLE

MANUAL SELECTION OF START OF PROGRAM and

PROGRAM VISIBLE AFTER SELECTION or not (as required)

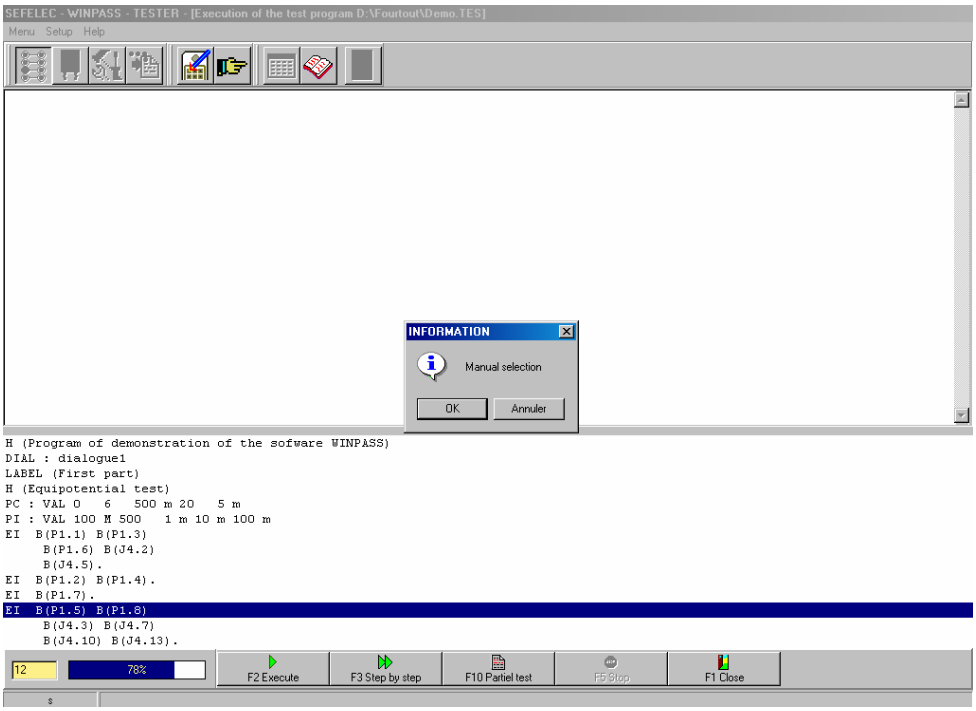
Click OK, expand the bottom window and, using the scroll box, look for the program line from which you wish to start the test.



Click on this line. An information box informs you that you are in manual mode. Click OK to confirm the test

Click on EXECUTE to start the test.

Warning: *This operation always results in a failed test. It is forbidden to start a partial test in the middle of a net.*



E.II.4.4 Safety during tests

In order to ensure that false moves are as far as possible avoided, certain functions are prohibited in the particular cases shown in the table below:

	Self test	Self learning	Test	Stop on fault	Starting screen
Probe	*no*	*no*	*no*	*yes*	*yes*
Manual mode	*no*	*no*	*no*	*yes*	*yes*
Switching matrix configuration	*no*	*no*	*no*	*no*	*yes*
Test configuration	*yes*	*yes*	*yes*	*yes*	*yes*
Quit WINPASS	*no*	*no*	*no*	*no*	*yes*

***WARNING**: use of manual mode can be dangerous for the equipment to be tested if the operator is not trained in its use.*

E.II.5 QUITTING THE TESTER FUNCTION

When the tester has completed its task, the operator has two options before him:

- • Stop the test of the reference in progress in order to access another test file. In this case, the tester function remains open. Just click on the icon:
- Stop the test and quit the tester function and return to the desktop. To do this, click in succession on the icons:

Bottom screen bar

Top screen bar

This button is only active if the tester has returned to the main menu, i.e. all applications are closed.

This documentation has no contractual validity, and the SEFELEC company reserves the right to modify any characteristic.

F. QUICK START

This chapter is not a summary of this manual and don't let you off reading the entire manual. It's a short list of the key recommendations for train operator

ENVIRONNEMENT (for further information see chapter B – II – 1 of this manual)

- Humidity 55% at 20℃;
- Temperature 15℃ to 30℃;
- Storage temperature: – 10℃ to + 60℃
- 230 V mains supply (± 15 %) 50 Hz (60 Hz possible on request)
- Earth < 3 Ω, microbreak < 10 ms

Connection to the main supply (for further information see chapter B – II – 2 of this manual)

The plugs are 16A single-phase + earth and must be protected by a 16A magneto-thermal circuit breaker and a differential of 30mA minimum.

INSTALLATING PROGRAMS (for further information see chapter D – I of this manual)

The software of the **SYNOR 4200** can only be used on a PC equipped with the operating system WINDOWS® 2000 or XP.

When installing for the first time, WINPASS must be installed before the PCI interface card (40528) is loaded. The PC must then be unplugged from the mains, the card loaded into its connector and the tester connection cable plugged in. Restart the PC, WINDOWS will install the interface card automatically. WINPASS is now ready for use

C:\PROGRAM FILES \ SEFELEC \ WINPASS This directory contains the tester operation software.

C:\SEFELEC\WINPASS This directory contains configuration files likely to be modified by the operator.

The test files will be saved to directories chosen by the user.

WARNING: *Test files must never be saved to* C:\PROGRAM FILES\SEFELEC\WINPASS *as they may be deleted during updates.*

SET UP (for further information see chapter B – II - 4 of this manual)

A key switch and an emergency circuit breaker controls supply of power to the whole instrument.

A signal tower allows tester is power on (green light) and tester is in test (red light)

CALIBRATION (for further information see chapter B – II – 5 -4 of this manual)

We recommend to calibrate our units each year. The calibration must be performed by qualified people having the complete procedure as well as correctly checked standards

SELF TESTS (for further information see chapter B – III – 5 of this manual)

Automatic self tests

As soon as the tester is switched on, or a when a function (test, self learning or self test) is initialized, the measurement units used by the function called are automatically tested.

Acquisition system failure - Acquisition system fail GAIN

This message indicates that there is no dialogue between the tester and the PC.

Check that:

The tester is switched on (mains supply present, 4A fuse correct, etc.)

The tester - PC connection cable is correctly connected.

Measuring card 40372 is correctly installed on the backplane and the flat bus 'info' cable is properly connected.

Cards 40403 and 40404 are correctly installed on the backplane and the flat bus 'info' cable is properly connected.

Current generator failure

Check that:

Measuring card 40372 is properly connected.
Relay contacts K15, K16 and K17 for routing card 40403, are open.

DC voltage generator failure

GoNoGo – Microbreak measurement failure

Insulation – Breakdown measurement failure

Check that:

HV generator card 40371 is properly connected.
Fuse F1 (100mA) has not been tripped.
Relay contacts K15, K16 and K17 for routing card 40403, are open.

Insulation measurement failure – Insulation voltage generator failure

Capacitance or Resistance measurement failure

Check that:

Measuring card 40372 is properly connected.
Relay contacts K15, K16 and K17 for routing card 40403, are open.

All these precautions make the tester extremely reliable in the quality of its results.

Self tests on demand

These self tests are designed to check the switching matrix. As this operation takes a relatively long time, it cannot be performed automatically.

These self tests must always be used before any self learning operation, after a prolonged stoppage of the tester or in any case of doubt.

Their function is to check that all the relays of the switching matrix open and close properly.

NOTE : It is impossible to perform this self test without disconnecting the wiring to be tested, but it is advisable to leave the interface, as the insulation test performed during the self test can give useful information about its condition.

Self tests frequency:

Weekly	or at each "self programming"	SELF TEST
Long shutdown		SELF TEST
Monthly		CLEAN FILTERS
Yearly		CHECK MEASUREMENT PARAMETERS
Yearly		CLEAN TESTER

Loop self test (for further information see chapter E – II – 2 of this manual)

NOTA : in Set-up “loop self test” is recommended to heat progressively the electronic of the tester. This function is efficient when a tester doesn’t reach insulation resistance threshold because of high humidity or long shutdown.

PRECAUTION DURING USE (for further information see chapter B – II – 6 of this manual)

The tester must never switch or receive external electrical power supplies that it does not control via its own software. Such power supplies include induction coils not fitted with "free-wheel diodes" or capacitors that are not discharged.

The tester is fitted with an **"external output"** function that can be programmed to connect two programmed points to a connector on the front panel. An external measuring instrument can be connected to this for specific measurements or troubleshooting. However, the following conditions must be observed:

- The external device must **NEVER** exceed the **MAXIMUM VOLTAGE** and **CURRENT** values permissible on the relays of the tester.
- Dielectrimeters and breakdown meters are **STRICTLY FORBIDDEN**.
- The "**external output"** must not be used as a generator switch.
- Any external power supply is forbidden as the routing relays are unable to switch it.
- In the case of an **external output** on a multiple insulation test, all or some of the points are short-circuited because the relays remain in place. Select STOP TEST to look for a fault on the equipment with an ohmmeter.

PRESENTATION OF THE ERROR LIST (for further information see chapter C – I of this manual)

Errors appear in red, PASSED test results in blue (on a full display).

Error messages:

1 – If there is a continuity or "broken circuit" error:

Continuity measurement error A (J1.12) B (TB1.EARTH) R > 250 Ohms

2 – If there is a continuity error due to a poor contact:

Continuity measurement error A (P4.21) B (J32.a) R = 15 Ohms

3 – If there is an insulation error due to a short circuit in relation to the lower points:

Insulation measurement error A (P6.AA) B (J12.5) R = 1.20 Ohms

4 – If there is an insulation error due to low resistance in relation to the lower points:

Insulation measurement error A (FRAME.EARTH) B (J24.1) R = < 50k Ohms

5 – If there is an insulation point with a long net (limited search is requested):

Insulation measurement error A (J4.T) B (J1.25) R = 1.25 Ohms

B (J2.28)

LIMITED SEARCH

6 – If there is an insulation error between 2 points:

Insulation measurement error A (point.34) B (point.237) R = 60MΩ

7 – If there is a breakdown or dielectric error on a point in relation to a net:

Insulation measurement error A (PRISE.12) B (J4.37) U= xxV

B (J4.39)

or T= xxxms

The time is given if the breakdown occurs during the application time. The voltage is given if there is a breakdown during the rise time.

8 – If the insulation test voltage was not reached by the end of the rise time, the error is close to a short circuit:

Insulation measurement error A (J45.12) B (P12.1) U<Uprog

9 – If there is a error during a test between 2 points, for all options:

FLT xxxxx A (TB1.5V) B (TB1.0V) xx = nnnn

ADVICE FOR REPAIR (for further information see chapter C – V of this manual)

Do not forget the role of the probe. This shows the points affected on the wiring on a table matching the tester point, intermediate interface point and user point.

NOTE: *There are two restrictions to using the probe: low-level and stimuli*